BUREAU OF HYGIENE AND TROPICAL DISEASES

TROPICAL DISEASES BULLETIN

Vol. 48] 1951 [No. 3

SUMMARY OF RECENT ABSTRACTS *

III. MALARIA

General

BOYD's comprehensive survey of all aspects of malariology, in which the various sections were written by authorities of international reputation, is reviewed at length on p. 502. The two volumes of this important work should be in the library of every serious student of malaria.

In his Croonian Lectures to the Royal College of Physicians, FAIRLEY (p. 3) referred to recent work on malaria, with particular reference to the life cycle of the parasite, and to chemotherapy.

A collection of aphorisms on malaria has been published by SERGENT (p. 948).

Epidemiology

SHUTE (p. 298) reviews the incidence of indigenous malaria in England after the war of 1939–45, and compares it with the incidence there after the war of 1914–18. The prevalence of the disease has declined and is now very low, and there is now little risk that men who acquired the infection overseas will spread it to local anophelines.

SWELLENGREBEL (p. 707) discusses the malaria epidemic of North Holland, which occurred in 1943–46. The only vector there is *A. maculipennis*, but larval control is not feasible in the drainage system which is necessary to the agricultural life of the country. Control by DDT residual spray in houses and animal houses appears to be effective. Epidemics of malaria appear from time to time, and the author argues that they are governed by the state of immunity of the people in the small foci concerned.

NAUCK (p. 5) discusses malaria in Western Germany, where it is endemic in several areas, including East Friesland, Schleswig-Holstein and Hamburg. SCHROEDER (p. 801) shows that there were outbreaks of malaria in many places in N.E. Germany in 1946–47. Many cases were in people who had returned from malarious countries, but more than half were autochthonous, transmitted, no doubt, by the prevalent *A. maculipennis* and *A. claviger*. In Hesse, on the other hand, only 8 of 237 cases were autochthonous in the same period (KREY, p. 802).

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1950, v. 47. References to the abstracts are given under the names of the authors quoted, and the pages on which the abstracts are printed.

Although in most malarious provinces of Italy the disease increased during the war of 1939–45, the incidence in the Province of Verona declined in that period. MARCOVECCHIO (p. 300) attributes this to the use by his staff of time-honoured methods of control, before DDT was available. As a result of war conditions, and probably because infective persons entered areas in which *A. maculipennis messeae* was present, malaria appeared in 1943–45 round Parma, Italy, from which it had long been absent (SOLETTA, p. 6). RAFFAELE and COLUZZI (p. 105) report the malaria epidemic which occurred in the Frosinone Province of Italy in 1945–48. In the early part of the epidemic there was a lack of material and of trained staff to cope with the outbreak, but in 1947 DDT became available in quantity, and a marked fall in prevalence of malaria followed its use as a house-spray. SENIGAGLIA (p. 299) shows that in Italy there was a remarkable decline in malaria morbidity and mortality in 1947, and briefly refers to the factors which may have contributed to this decline, including the systematic use of DDT.

A malaria survey of Corsica is reported by TOUMANOFF and RAGEAU (p. 104) who show that the average spleen and parasite rates were 36·3 and 23·4 per cent., which are higher than rates reported before 1930. They give details of the anophelines found, and of their breeding habits.

MORUZZI (p. 582) describes the malaria situation of the island of Saseno, in the Bay of Valona, Albania.

GUERRIERI (p. 582) states that Algeria has suffered severe epidemics of typhus (1942), relapsing fever (1945) and malaria (1946) and that the number of deaths due to malaria was much higher than the numbers due to the other two diseases. PARROT and CATANEI (p. 428) studied the infection of infants with the three common species of malaria parasites in a hyperendemic area of Algeria. Most were infected in the first year of life in spite of the prophylactic administration of drugs throughout the transmission season.

The incidence of malaria is not high in the Beni-Hassan district of Morocco (PEREDA REGUERA, p. 428).

Malaria in British Somaliland has been investigated by Bagster WILSON (p. 300), who shows that it is almost absent from the coastal plain and the central plateau. It is endemic in small foci in the northern foothills, and epidemics occur in the southern grazing areas, which depend on rainfall. In a survey made during a severe epidemic the findings indicated that there was not much effective immunity. The same author (p. 517) contributes a summary of the findings of CALLANAN, who, 20 years ago, made a malaria survey of the Machakos district of Kenya. The results were not published, but indicated that incidence varied from slight endemicity to true hyperendemicity. HEISCH and HARPER (p. 6) record an epidemic of *P. falciparum* malaria carried probably by *A. funestus* in the Kenya highlands.

P. falciparum was the commonest parasite found in Liberia by YOUNG and JOHNSON (p. 428) in an extensive survey of 18 areas. Infection rates were highest at age 1–4 years, and parasite counts were high in infancy, declining rapidly in early childhood. The anophelines of the *gambiae-melas* group constituted 94 per cent. of adults found, and 6·45 per cent. were infected.

SCHWETZ *et al.* (p. 191) found evidence that malaria (mostly *P. falciparum*) is hyperendemic in the Kwango district of the Belgian Congo, and name the mosquitoes found, which include *A. dureni* and *A. concolor* in addition to the more well-known species. GEUKENS (p. 949) has published notes on two areas of the Belgian Congo where spleen and parasite rates in infants are high, where scarcity is rife and where natural increase of population is low.

LINDBERG (p. 106) has studied malaria in Afghanistan, where it is endemic with moderate prevalence, though there are hyperendemic areas. The period of transmission lasts 4–5 months only, and *A. superpictus* is the only carrier

identified by the author, though *A. sacharovi* and *A. claviger* may possibly act as vectors.

In the hilly Malnad part of Mysore malaria is common and is transmitted by *A. fluviatilis* ; RAO (p. 429) states that this fertile area is gradually becoming depopulated as a result of malaria and hookworm infection. House spraying with DDT has resulted in a noteworthy reduction of malaria.

JAYAWARDENE (p. 315) shows that in Ceylon the heaviest incidence of malaria in a group of patients in 1943–45 was during the period December to May. More than half had *P. vivax*, about one-third *P. falciparum*, and a few *P. malariae*.

In Malaya the incidence of malaria shows a steady decline, but the reason for this is not clear. MACGREGOR (p. 301) reports on various activities, which include drug prophylaxis in schools, and the use of DDT in oil as a larvicide.

In 1943 British and Australian prisoners of war were sent from Singapore to work on the construction of a railway in Siam. WILSON and REID (p. 192) report that almost half these men died within 12 months as a result of malnutrition, dysentery, cholera, malaria and tropical ulcer. Malaria was the sole cause of death in 4 per cent. of those who died, but was an important contributory cause in many other deaths. *P. vivax* was the predominant parasite and the vectors included *A. maculatus*, *A. minimus* and *A. leucosphyrus*. Other species were also found.

PANTHIER (p. 192) discusses the malaria of new arrivals in malarious areas of Indo-China. Almost all cases are due to *P. vivax* or *P. falciparum*, and the incidence of *P. malariae* is considerably less than in the indigenous population. The author suggests an explanation of this.

A health survey of part of New Guinea is reported by BERN and HANSEN (p. 1052), who give information on the incidence of malaria ; mosquitoes of the *A. punctulatus* group are common.

Malaria is normally only a minor problem in Okinawa, but DOWNS (p. 107) states that during the war it caused an extensive outbreak among refugees living in camps. He points out that the operations of war may greatly alter normal biological balances, creating conditions favourable for malaria. *A. hyrcanus sinensis* is the vector.

BRADLEY and GOODWIN (p. 301) comment on the decline which has taken place in the incidence of malaria in the United States. A description of malaria in the southern part of the California peninsula is given by DOWNS and BORDAS (p. 429). It is due to *P. vivax*, is only moderately prevalent, and is transmitted by *A. pseudopunctipennis typicus*.

THOMPSON (p. 804) shows that a small outbreak of malaria occurred at a United States military installation in Jamaica, where the number of *A. albimanus* rose to more than 5 per trap per night. In comment, TREDRE states that the comparable critical figure in Porto Rico is 2.

GABALDON (p. 4) gives an account of the organization of anti-malarial work in Venezuela in recent years, and of the results achieved. There are 2 vectors, *Anopheles darlingi* and *A. albimanus*, and all degrees of endemicity are found, the predominant parasite being *P. falciparum*. Since 1945 the use of DDT as a house spray has greatly reduced the mosquitoes, the incidence of malaria and the death rate from malaria, and the general picture has radically changed.

Malaria occurs in the city of Santos, Brazil, but the incidence is low. CODA and RAMOS (p. 430) show that the common parasite is *P. vivax* and the vector *A. tarsimaculatus*.

Transmission

BIOCCA (p. 802) suggests certain simple tests by which blood in the stomach of a mosquito can roughly be identified without the use of the precipitin test. Details should be sought in the original.

FESSLER *et al.* (p. 1169) discuss the anophelines of South Württemberg, and LACHMAJER (p. 951) those of part of Poland, most of which are of the *maculipennis* group. EICHLER and PAGAST (p. 431) discuss the duration of each of the four larval stages of *A. messeae*, but for details the original should be consulted.

The distribution of anophelines in Morocco is described by GAUD *et al.* (p. 803).

GARRETT-JONES (p. 583) notes that in Egypt in 1942 two mass migrations of *A. pharoensis* occurred. The swarms were probably wind-borne and were found 18–28 miles away from the nearest breeding places.

BRUCE-CHWATT (p. 951) reviews recent work on the vectors of malaria in West Africa. MATTINGLY (p. 304) has studied the seasonal distribution, biting cycle and vertical distribution of four mosquitoes in West Africa, one of which was *A. gambiae*. The peak activity of *A. gambiae* was found to be in the early morning. He also (p. 583) contributes a similar paper on mosquitoes less commonly found in the forest areas. A list of mosquitoes and other blood-sucking Diptera found in Liberia is given by BRISCOE (p. 305).

TISSEUIL (p. 585) refers to the breeding places created by methods of cultivation practised in the French Sudan. HOLSTEIN (p. 803) reports natural infection of *A. rufipes* in French West Africa. Infection was found by JADIN and FAIN (p. 431) in a high proportion of *A. funestus* in hilly country in Ruanda-Urundi.

BERNET (p. 195) shows that *A. gambiae* is the vector of malaria in Dakar. HOLSTEIN (p. 584) has observed two forms of *A. gambiae* in French West Africa. One form is small, breeds in collections of rain water and does not remain long in houses, but rests outside. The other form is larger, breeds rather in permanent or semi-permanent water, and remains in houses to mature its eggs. If the two forms are biologically distinct it seems that house-spraying will control only the larger form.

WANSON *et al.* (p. 585) show that in both *A. moucheti* and *A. gambiae* fed on carriers of gametocytes of *P. falciparum*, sporozoites were found in 11 days at 24°C. The infection rate in *A. gambiae* reared in the laboratory was a little lower than the rate found in wild-caught *A. gambiae* (24 per cent., with sporozoite rate of 8 per cent.).

Experiments in Sierra Leone have shown that individual persons vary in their attractiveness to unfed female anophelines (*A. melas*, *A. gambiae* and *A. funestus*), and that the attractiveness of one person varies from time to time. RIBBANDS (p. 108) found that in houses containing several men more anophelines were present than in houses containing only one. HADAWAY (p. 1054) found in Uganda that attempts to catch *A. gambiae* in huts at night resulted in 2·5 times as many captures as attempts made in the mornings only. In tests of the efficacy of various preparations of DDT as residual spray he found no surviving mosquitoes (largely *Taeniorhynchus*) two weeks after the use of a water suspension, but considerable survivors after kerosene solution. Later there were more survivors which had evidently not received a lethal dose. In the early weeks there was little difference in mortality between those caught in the treated huts and those caught in window traps when attempting to leave the huts. In an intensively cultivated part of Eritrea, where irrigation has been used on a large scale, MARA (p. 948) shows that *A. gambiae* is the principal vector. Irrigation has greatly increased the potentialities for breeding of anophelines, but has also greatly increased the economic and social well-being of the people. In an account of the mosquitoes of N. Rhodesia, ROBINSON (p. 586) notes that the peak of *A. gambiae* is reached after the rains in January, and that the peak of malaria follows. *A. funestus* is present but has little influence on the malaria of the built-up European areas, though it may be responsible for some of the cold weather malaria, when *A. gambiae* is rare.

HENDERSON (p. 949) discusses the man-made breeding places (seepages from water channels, borrow pits) which contribute much to the incidence of malaria in India, and the steps necessary to reduce them.

SEN (p. 517) has studied the breeding of anophelines in the rice fields of Lower Bengal, where *A. philippinensis* is the vector. The rice fields are probably not nearly so dangerous as breeding places as the permanent village ponds. In West Bengal he (p. 518) reports infection in *A. sundaicus*, *A. philippinensis* and *A. minimus*.

VENKAT RAO (p. 950) writes of malaria in Orissa. Hyperendemic malaria occurs in the hills, where *A. fluviatilis*, *A. varuna* and *A. minimus* are the vectors and transmission is perennial. In the plains *A. annularis* is the vector and malaria is seasonal, with occasional epidemics. On the coast *A. sundaicus* is the vector, the fresh-water strain being more effective than the salt-water strain. SUBRAMANIAN and DIXIT (p. 431) found infections in *A. culicifacies* and *A. fluviatilis* in a district of the Central Provinces, India, where the transmission season extends from September to January.

Detailed study of *A. minimus* by RIBBANDS (p. 196) in Assam suggests that the life cycle in monsoon conditions occupies 14 days—egg stage 2, larval stage 7, pupal stage 2, leaving 3 days for the period between emergence of the adults and the laying of eggs. In villages near the Yunnan-Burma border CHOW and BALFOUR (p. 709) found that the only naturally infected anopheline was *A. minimus*. The general infection rate was 1·1 per cent., but there was a peak up to 9·0 per cent. in July–November.

DE FLUITER (p. 709) records the anophelines prevalent in West Siam, where there were two prisoner-of-war camps.

HSU *et al.* (p. 952) report observations on the longevity of *A. hyrcanus sinensis* under various conditions of temperature and humidity. The anophelines of Formosa are discussed by CHOW (pp. 432, 518). *A. hyrcanus sinensis* is probably the chief vector in the plains and *A. minimus* in the hills.

The anopheline mosquitoes of North-West Borneo are described by COLLESS (p. 109), who gives details of their distribution and their breeding places.

In New Britain, *A. farauti* breeds in shaded pools, and *A. punctulatus* in man-made temporary rain-pools open to the sun. LAIRD (p. 432) points out that *A. farauti* is the more consistent vector because it breeds in more permanent water, but *A. punctulatus* could become more important if malaria discipline was relaxed and if conditions suitable to breeding were permitted. Malaria is very prevalent in the Treasury Islands (British Solomon Islands), where PERRY (p. 497) reports that *A. farauti* is found.

SABROSKY (p. 196) gives an account of the anopheline mosquitoes of southern Michigan, with keys for the various stages.

SNOW (p. 804) describes a portable privy type of trap which was found more effective than other types for *A. quadrimaculatus* in the Tennessee Valley. TERZIAN and STAHLER (p. 305) studied the characteristics of *A. quadrimaculatus* developed from water in which there was adequate food but the larvae had been either relatively sparse or relatively crowded. In conditions of over-crowding, pupation is delayed, the pupae are light in weight, females which emerge have low biting rates and a relatively high mortality. In an experiment with stained *A. quadrimaculatus*, GOODWIN (p. 433) found that most females remained around the breeding place for a day or two after being stained, probably to mate and oviposit. No stained females were seen after the 15th day.

BELLAMY (p. 952) has found evidence which suggests that *A. quadrimaculatus* adults emerge each month, but not each week, from breeding places in Georgia, U.S.A., during winter. ZUKEL (pp. 432, 433) has made observations on *A. quadrimaculatus* and other mosquitoes in Georgia, in winter. In N. Alabama inseminated *A. quadrimaculatus* hibernate in caves, and the first eggs are

deposited in February or March. HESS and CROWELL (p. 8) show that temperatures during February and March have an important effect on the extent of mosquito production during the subsequent breeding season ; higher temperatures favour heavier production. FROHNE *et al.* (p. 709) have made observations on the persistence of plasmodial infections in *A. quadrimaculatus* in southern United States, although human infections had become very rare. They discuss various possible explanations of this fact, but without reaching a satisfactory conclusion.

DOWNS and BORDAS (p. 587) have found *A. aztecus* naturally infected with plasmodia in Mexico.

VARGAS (p. 307) discusses differential morphological characters of pupae of some Neotropical anophelines.

KAHN and OFFENHAUSER (p. 194) have recorded the sound emitted by female *A. albimanus* and have used these recordings to attract male mosquitoes to an electrified grid, on which they were electrocuted. The same authors (p. 195) have analysed the sounds emitted by certain African mosquitoes.

COUTINHO (p. 710) discusses anophelines of the sub-genus *Kerteszia*. RACHOU *et al.* (p. 197) have studied *A. cruzii* and *A. bellator*, two vectors which breed in association with bromeliads in Brazil, and have found that the larval index was greatest in bromeliads over 5 metres from the ground in one place, and 2 to 5 metres in another. Traps indicate that these mosquitoes are attracted to man more than to animals. RACHOU and AZAMBUJA (p. 590) show that these mosquitoes of the sub-genus *Kerteszia* enter houses at all times of the day and night, but especially at 6 a.m. and 7 p.m., and that they will bite in the open. RACHOU *et al.* (p. 588) have made a survey of the resting places of *A. bellator* and *A. cruzii* in Brazil. Most of those caught in houses were engorged, and showed a slight preference for sleeping rooms. They rested chiefly on ceilings and the upper parts of walls. On the other hand, *A. darlingi* showed a marked preference for sleeping rooms, though less than one-third were engorged ; almost all rested on walls, mostly at middle height. These facts should be borne in mind when insecticide sprays are used.

DEANE and DAMASCENO (p. 710) agree that *A. darlingi* (and also *A. aquasalis*) rest on the lowest two metres of house walls.

BORGES (p. 587) shows the distribution of *A. darlingi* in part of Brazil. Several other species are also found, of which the most common is *A. albitarsis*.

RACHOU *et al.* (p. 805) have found *A. aquasalis* in part of Brazil 52 kilometres from the coast, and provide evidence that compared with *A. albitarsis* it shows a strong tendency to seek houses. It was responsible for an epidemic of malaria in 1949.

The anophelines of part of southern Brazil have been surveyed by DE BUSTAMANTE *et al.* (p. 587).

DE ZULUETA (p. 953) reports a study of the anophelines inhabiting the savanna country of eastern Colombia.

Anopheles nuñez-tovari has been found naturally infected with plasmodia in Colombia (REY and RENIFO, p. 1170).

In South America west of the Andes *A. albimanus* is the chief vector of malaria in the coastal zone. LEVI CASTILLO (p. 306) notes that this mosquito passes the rainless season in the egg stage, in mud ; it is usually found below 900 feet. *A. pseudopunctipennis* is found above 300 feet and breeds in clear water. *A. punctimacula* is only slightly attracted to man, but is often abundant and may be responsible for some transmission. SASSE and HACKETT (p. 1055) found that *A. pseudopunctipennis* in Peru was zoophilic.

Immunity

Bagster WILSON (p. 516) discusses the broad problem of malaria in East Africa. Three types of zone are found, the epidemic, the hyperendemic and the endemic. In the hyperendemic zones there is little malaria in the adult population, but partial protection from mosquito bites, the use of drugs, immigration of non-immune persons, etc., lead to a decrease of resistance.

In the other zones there is little immunity. DDT house spray alone will probably not be effective in the hyperendemic zones, but may be so if applied to large numbers of houses over a big area where malaria is endemic. In rural communities fundamental measures such as siting of villages and control of water remain of great importance. One of the main pieces of research still to be done is to find out more precisely the effect of malaria on the health of people in hyperendemic areas.

SWELLENGREBEL (p. 193) describes a community in New Guinea in which hyperendemic conditions of malaria are present, and in which a considerable degree of immunity is attained, though not to the same extent as in some parts of Africa. He thinks that the view that there may be an inherited capacity to reach a high degree of immunity has still not been disproved. The same author (p. 1053) discusses the host-parasite relationship of a community of bush negroes in the interior of Surinam, of whom accurate vital statistics have been kept by a priest for 12 years. The prominent parasite is *P. falciparum*, and infection rates are very high in infancy and childhood, but much lower in adult life, when illness due to malaria is rare. Swellengrebel argues that the high infection in infancy does not markedly influence mortality, and that on the whole the parasites and the hosts live harmoniously together, as is the case in central Africa. He advocates treatment of cases to keep parasites at a low level rather than to eradicate them, and thinks that *Anopheles* control should not be undertaken unless it can (and will) be continued. In comment, MACDONALD argues that the infant and child death rates are very high, and are similar to those of India, where malaria plays an acknowledged part in mortality, and that it is difficult to see how any one disease can be absolved from blame for part of these high rates.

Aetiology

The important discovery of the pre-erythrocytic forms of *P. falciparum* in a volunteer who was heavily infected by bite by *Anopheles maculipennis atroparvus* and *A. quadrimaculatus*, is described by SHORTT *et al.* (p. 193). These forms occurred in the liver cells, as was the case with similar forms of *P. vivax* and *P. cynomolgi* (in monkeys).

HUFF (p. 1163) has questioned the malarial nature of the exo-erythrocytic bodies which Shortt and his colleagues have described as part of the developmental cycle of human and monkey malaria parasites. In comment, COVELL answers the objections raised by Huff.

GALLAIS *et al.* (p. 7) describes bodies in the bone marrow of 15 of 84 persons from Indo-China, most of whom had malarial infection, which they diagnosed as exo-erythrocytic forms of the parasites ; these were always non-pigmented and extra-cellular, and they were never found in non-malarial patients. The parasites were probably within reticulo-endothelial cells originally, but became detached while the smears were being made. GARNHAM discusses these forms, and thinks that they probably do not represent another biological cycle. BLANC and LANGUILLON (p. 6) also report bodies which they think are exo-erythrocytic forms of malaria parasites in the bone marrow of 6 patients from Indo-China or Madagascar. The exact significance of these bodies is not yet known.

DECOURT (p. 302) sets out his conception of the course of development of malaria parasites from the stage of inoculation of sporozoites into the skin. In comment, GARNHAM states that the views expressed conflict with others more generally held.

FIELD (p. 8) discusses the form and distribution of pigment in malaria parasites of the three main species which affect man.

BALDI (p. 303) shows that the curve of parasitaemia with *P. vivax* tends to coincide with the reticulocyte curve ; he thinks that " reticulocyto-tropism " of *P. vivax* is an essential rather than a preferential phenomenon. KINKEL (p. 107) has studied the invasion of reticulocytes by *P. vivax*.

YOUNG and EYLES (p. 304) found what they took to be *ovale* forms in the blood of a small proportion of patients infected with *P. vivax*.

RAGAB (p. 109) has been able to maintain alive for 4 days the isolated gut of a mosquito, but oöcysts in the gut did not grow. SINGH and DAVID (p. 1169) describe methods of staining oöcysts and sporozoites.

Pathology

An extensive biochemical study of the effects of *P. vivax* malaria induced by blood injection has been made by HENSCHEL *et al.* (p. 519). Some bodily systems are seriously upset, others very slightly. Details should be sought in the original. MÉCHALI *et al.* (p. 310) find that the serum cholinesterase level is reduced in malaria, in proportion to the duration of the attack, and that the reduction seems to be greatest in *P. malariae* and least in *P. vivax* infections.

As a result of biochemical and pathological studies of pernicious malaria, MASSIAS (p. 111) concludes that the attacks are not due to thrombosis of cerebral vessels, but are toxic in origin. The dominant features are profound involvement of the reticulo-endothelial system of spleen and liver, damage to endothelium of blood vessels and damage to spleen, liver and kidneys. Prompt treatment is essential. Focal adrenal cortical necrosis in an overwhelming infection with *P. falciparum* is described by GOLDEN and OVERMAN (p. 110).

MAEGRAITH and his colleagues (pp. 197, 198) have studied the circulation in the liver, first the active constriction of the venous tree induced by anaphylactic shock, which produces a fall in venous outflow and centrilobular congestion of liver substance, and second the micro-anatomy of the circulation as demonstrated by injection of various substances into the portal system, the hepatic arterial and venous system and the bile ducts. These studies have a bearing on the pathology of malaria.

SCHNEIDER and HARTMAN (p. 311) and their colleagues (p. 433) performed various tests of liver function during the course of therapeutic malaria in a number of patients ; the results indicate true but reversible liver dysfunction. SCHNEIDER (p. 1055) shows that various tests of liver function give abnormal readings in attacks of malaria. CASULA (p. 1171) writes to similar effect.

LUBITZ (p. 307) has studied the pathology of the ruptured spleen in acute *P. vivax* malaria.

Diagnosis : Clinical Findings

FIELD (p. 307) has published a descriptive atlas of thick-film diagnosis of malaria, in which he discusses the zoological position of the plasmodia, gives a description of the organisms in thick films, and discusses technique. The parasites dealt with are *P. vivax*, *P. falciparum* and *P. malariae* only ; there is no description of *P. ovale*. The atlas is profusely illustrated, and is a most authoritative work, by a writer of distinction.

ZACHARIAS (p. 590) has compared bone-marrow biopsy with blood examination in the diagnosis of malaria in West Africa, and concludes that marrow examination is not of much value, a conclusion with which GARNHAM, in

comment, does not agree. FISCHER (p. 309) has investigated the value of sternal marrow puncture in *P. vivax* malaria, and concludes that it is no help in diagnosis if blood examination is negative, and therefore has no value so far as prognosis of relapse is concerned. A study of the bone marrow in *P. vivax* malaria is reported by KNÜTGEN (p. 199).

In simultaneous staining of many blood slides in one vessel there is a definite risk that blood elements may be transferred from one slide to another. BROOKE and DONALDSON (p. 518) show that this can largely be obviated by adding a surface active agent (Triton X-30) to the Giemsa stain.

BIANCO (p. 711) has studied red-cell resistance in malaria.

STOLL (p. 434) refers to percussion of the spleen as a useful means of determining enlargement.

A monograph on the serological reactions in malaria, in relation to immunity, has been written by HORMANN (p. 174). WESTPHAL (p. 1056) discusses the Henry reaction. ZIPF (p. 311) shows that the melanin flocculation test depends on an increase in euglobulin associated with immunity processes, and is not specific to malaria. It is an indication of the behaviour of the body defence mechanisms. HORMANN (p. 311) reaches similar conclusions. HENRY (p. 310) has prepared an artificial haemozoin which can be used in place of melanin in the flocculation test.

HORMANN (p. 313) discusses the incubation period of the three common forms of human malaria.

DE GRAAF (p. 314) discusses relapses in the three common forms of malaria in prisoners of war observed in Batavia.

KLINGER (p. 315) thinks that malaria in a person whose spleen has been removed tends to be more virulent than in the normal person.

THIODET and FOURRIER (p. 110) draw attention to the analogies between the symptoms of malaria and those of anaphylactic shock. They have attempted to suppress attacks of malaria by desensitizing patients with intradermal injection of autoglobulins. They claim some success, and the method may be valuable in pernicious malaria. RADOSAVLJEVIC (p. 1170) thinks that febrile attacks in malaria are allergic manifestations, and shows that they can be influenced by anti-histaminic substances. MOHAPATRA (p. 316) reports an urticarial reaction in the course of malarial infection, which was relieved by paludrine. THIODET and FOURRIER (p. 316) describe a case of asthma, apparently of malarial origin, which was immediately cured by intramuscular quinine.

NANDI (p. 200) refers to 5 cases of malaria in which the patients exhibited unusual manifestations.

PAESI (p. 9) points out that in the Netherlands the symptomless carrier of *P. vivax* is of great importance in the spread of malaria. The vector has only a limited period of transmission activity, from August to October. Autumn infections generally exhibit an incubation period of about 9 months, and few or no parasites can be found until shortly before the clinical attack. In people who have had a clinical attack the parasites may be present for periods of 12 days, and similar periods of absence may alternate with them. There may be no symptoms.

V. HALLER (p. 312) refers to the long incubation period which characterizes strains of *P. vivax* found in Europe, and gives details of a strain which originated in Russia. The same author (p. 711) shows that superinfection with a homologous strain of *P. vivax* is possible by mosquito bite in the long period of freedom from fever between the primary attack and the relapse. He discusses the problem of immunity. The presence of tissue forms of malaria parasites, without blood forms, probably does not give protection against blood forms, and superinfection can produce clinical manifestations even when blood forms are present. He (p. 712) discusses relapses in *P. vivax* malaria, which are related to maturation of

the tissue forms, but in which the resistance of the body plays a part. A previously acquired resistance hinders the development of the erythrocyte phase.

From observations on persons who had acquired malaria and who subsequently left the endemic area, FISCHER (p. 313) found that nine-tenths of those with *P. vivax* had their last attack within a year of leaving the endemic area, the number of relapses varying from one to twelve. No recurrence of *P. falciparum* malaria occurred later than 6 months after the patient had left the endemic area.

COATNEY *et al.* (p. 1171) studied the course of mosquito-induced infections with *P. vivax* of the St. Elizabeth strain in 198 persons, some of whom received various drugs either for clinical prophylaxis or for treatment. In those who did not receive prophylactic drugs, most of the primary attacks occurred within 20 days, but in three persons they were delayed for 9 months or more. In those who received prophylactic medication some had early primary attacks but in all these the medication was obviously inadequate ; others had delayed primary attacks. Long-term latency was not dependent on the season when infection occurred, on dosage of sporozoites, degree of early patent parasitaemia or on the nature of non-curative therapy received. During long-term latency, subinoculation was negative, and superinfection with the homologous strain could be accomplished.

When inoculated by mosquito bite, the Chesson strain of *P. vivax* usually produces several closely spaced attacks, whereas the St. Elizabeth strain usually produces an early primary attack followed by several months of latency and a series of late attacks. COOPER *et al.* (p. 1172) have studied single and mixed infections by these two strains.

COOPER *et al.* (p. 314) show that after apparently successful treatment of *P. vivax* malaria induced by mosquito bite, even negative transfusion to another person of 250 ml. of the infected person's blood is not evidence of cure, since in several such persons there was relapse after negative transfusion. The parasites in the fixed tissue cells only periodically release forms which invade the erythrocytes.

MUKHERJEE and MITRA (p. 954) report a case of *P. vivax* malaria in which abdominal colic and urticaria were features ; treatment with proguanil cleared up these symptoms.

THIODET and FOURRIER (p. 315) report three cases with pernicious symptoms, apparently due to *P. vivax* infection. THIODET *et al.* (p. 111) report a pernicious and fatal attack of *P. malariae* infection in an Algerian.

Cases of congenital malaria are recorded by VAN LAWICK VAN PABST (p. 199), SICÉ and BINDER (p. 805), and JONES (p. 1056). The last records three cases of congenital *P. falciparum* malaria in European infants in West Africa ; all three infants died. The mothers had not recently suffered from attacks of malaria, and the placentas were macroscopically healthy and intact.

Cerebral malaria is fairly common in African children in Dakar, and BERGERET (p. 9) shows that its onset is often sudden, sometimes with transitory hemiplegia or other pareses. For diagnosis, puncture of the tibia may help. He discusses differential diagnosis and treatment. Malaria due to *P. falciparum* was responsible for symptoms of severe cerebral disease in four cases described by SIGUIER *et al.* (p. 1173). Recovery followed antimalarial treatment in all, but the authors comment on the importance of considering malaria in such cases, and looking for it.

TALBOT *et al.* (p. 591) describe cases in which epilepsy was apparently a sequela of chronic relapsing malaria, which had caused cerebral damage.

Charles Wilcocks

[*To be continued*]

MALARIA

SWELLENGREBEL, N. H. **How the Malaria Service in Indonesia came into being, 1898–1948.** *J. Hygiene.* 1950, June, v. 48, No. 2, 146–57.

Professor Swellengrebel summarizes the history of the discovery of the mode of transmission of malaria and gives an account of the early days of modern knowledge of the disease, until the time of the visit of Sir Malcolm Watson to Sumatra in 1913.

He then relates some experiences which convinced him and some others that the formation of a separate Malaria Service for Indonesia was essential. During a malaria epidemic at Siboga *Anopheles sundaicus* was incriminated and, remembering Sir Malcolm's advice, measures for its control were devised. Siboga thus became the first example in Indonesia of malaria control by "species sanitation". Later, in the Mandailing valley, after the elimination of fish ponds breeding *A. sundaicus* the spleen rates fell in a few years from 90 per cent. to 10 per cent. though none of the other anophelines was affected by the measure. At a place in Java, where the introduction of an irrigation system had rendered the cultivation of rice independent of local rains, periodical epidemics swept over the area. The vector in this case was *A. aconitus* breeding in the rice fields. A planting schedule was enforced, which arrested the exhaustion of the soil and doubled the rice crop. It also reduced the breeding of *A. aconitus* and brought down the incidence of malaria to insignificant figures where it remained until the Japanese invasion. During the occupation the population continued with the planting schedule in the face of persistent Japanese "discouragement". In 1946, conditions were not so good as in 1941 but the spleen rate was as low as 30 per cent.

The long campaign to form a Malaria Service in Indonesia which began about 1917, met with a great deal of professional and other opposition. Eventually, Rodenwaldt succeeded in convincing the authorities that a separate service could no longer be dispensed with and he was made its first chief.

H. S. Leeson

KUPKA, E. & ANSCHAU, M. Entomologisch-ökologische Untersuchungen an steirischen Malariaherden. [**Entomological and Ecological Studies on Malarial Foci in Styria.**] *Acta Tropica.* Basle. 1950, v. 7, No. 4, 298–314, 2 figs. (maps). [32 refs.]

Styria (Steiermark) lies in the south-east of Austria and borders on Hungary and Yugoslavia. Its lowlands are liable to become malarious because of immigration from the Balkans. Single cases of malaria have been reported from its south-eastern parts since 1900, but in 1935, benign tertian malaria was found further west at Arnfels. Since anophelines were breeding in carp ponds, as well as in old clay pits, no insecticides could be used, but various sanitary measures were applied with apparent success.

In 1941, however, isolated cases of malaria occurred, with foci in the Kaiserwald (near Graz), and at Kirchberg, on the River Raab. Mosquitoes were again breeding in the carp ponds of a former Cistercian monastery and in the clay pits. The principal vector was *Anopheles maculipennis*, north of Graz; the rare *typicus* was found on high ground, and in the south, mostly the *messeae* race. *A. bifurcatus* and *A. nigripes* were also found together with species of *Culex*, *Theobaldia* and *Aëdes*. These however have no epidemiological importance. Infection probably occurred at night in houses where mosquitoes were found in large numbers by day. It was found that some houses were very heavily infected and that only small areas were dangerous.

Rooms in houses were dusted with 10 per cent. DDT powder, and outhouses with solutions of 5 per cent. strength or more. Mosquitoes and other biting flies were considerably reduced in numbers. Persons suffering from malaria received plasmoquine and atebrin [mepacrine]. *J. H. Sudd*

BUONOMINI, G., MACCARRONE, A. & MOTTA-DIANA, A. Osservazioni sulle caratteristiche dell'endemia malarica in una zona della Sicilia sud-occidentale. [**Characteristics of Endemic Malaria in an Area of South-west Sicily.**] *Riv. di Malariologia.* 1950, Apr., v. 29, No. 2, 85–106, 8 graphs. English summary (8 lines).

These observations were carried out in the commune of Raffadali (Agrigento Province) and adjacent areas in the south-west of Sicily between 1942 and 1946. The area studied covers 193 square kilometres, mostly agricultural land which is hilly in parts. Raffadali has a population of 12,300 of which only some 300 are permanently settled in the countryside. The great majority live in the town though working from morning to night at agriculture in country round the town, except for periods of greatest agricultural activity. At such times the workers and their families migrate nearer to the scene of their labours, where they live in makeshift shelters. Housing conditions in the town are extremely poor : the inhabitants live in close proximity to their domestic animals. The economic level of the population is very low ; malnutrition is rife. Anopheline breeding places are numerous, of special importance being the pools in the rocky beds of two streams. The sole anopheline is *A. maculipennis labranchiae.* Malaria flourished.

Anti-larval measures were prosecuted with vigour but the difficulties were great. Greater success attended the use of antimalarial drugs. In 1941 a survey disclosed that 4,500 persons, 37·5 per cent. of the population, were infected. In 1942 some 2,830 infected persons were treated during the inter-epidemic period with courses of either italchina [see this *Bulletin*, 1941, v. 38, 34] and plasmoquine or italchina and certuna [see this *Bulletin*, 1938, v. 35, 562, 563]. This procedure was continued in subsequent years. Clinical cases received prompt treatment. The cumulative effect of these measures was remarkable. The total number of malaria cases recorded in each of the six years 1941–1946 were : 4,500, 2,638, 1,656, 976, 347 and 329. Of the 329 cases in 1946 185 were *P. vivax* infections, 144 *P. falciparum.* In the earlier years the predominance of *P. vivax* infections was much more marked.

The curve of seasonal prevalence of malaria in this part of Sicily is bimodal : a rise during the spring months reaches its height in May and is due almost exclusively to *P. vivax* infections. The second peak in August–September is in large part representative of *P. falciparum* infections which are practically absent during the first half of the year. The authors stress the similarity of this malaria epidemicity with that observed in the Balkan countries, which differs considerably from the usual course of events in south-west Italy and the Italian islands. *Norman White*

ROMEO, V. Risultati dello studio dell'anofelismo nella provincia di Reggio Calabria. [**Anophelism in the Province of Reggio Calabria.**] *Riv. di Malariologia.* 1950, June, v. 29, No. 3, 149–68, 9 figs. & 3 charts. English summary.

This is a detailed report of an anopheline survey of Reggio Calabria. More than 15,000 adult anophelines were captured and identified during the course of a year. The species found were : *Anopheles maculipennis labranchiae, A. maculipennis typicus, A. hyrcanus* var. *pseudopictus, A. superpictus, A. italicus,*

A. claviger, *A. algeriensis* and *A. plumbeus*. Only two of these frequent human habitations and have a marked preference for human blood—*A. m. labranchiae* and *A. superpictus* : they are responsible for malaria transmission ; their ecology is fully described.

Morphological differences are described which enable the larvae of *A. m. typicus* to be distinguished from those of *A. m. labranchiae* : they relate to the structure of the external anterior clypeal hair and to the number of the abdominal palmate hairs which begin on the second urotergite in *A. m. typicus* larvae and on the third urotergite in *A. m. labranchiae* larvae. Differences in shape and colour of the tergal plates of five of the species are described : these differences are sufficiently marked for purposes of species identification. A description is given of the eggs of *A. superpictus*. *Norman White*

MACAN, T. T. **Malaria Survey of the Arakan Region of Bengal and Burma.** *Parasitology*. 1950, Oct., v. 40, Nos. 3/4, 290–97, 2 figs.

The area surveyed is a strip of country between the sea and the first mountain range on the east side of the Bay of Bengal ; it includes part of Bengal and part of the Arakan district of Burma and has been little visited by malariologists.

Not much is known about malaria and mosquitoes of the mountain region. The only facts noted were that adults of *Anopheles maculatus* did not bite man and that out of 73 *A. minimus* dissected one was found infected in April.

In the hillocks and the coastal plain, examination of the blood of the villagers revealed active transmission in March and April and past transmission in May and June. The survey data are presented in six tables dealing with twenty-one species of *Anopheles*.

Breeding places and adult haunts are described and the main trends of the seasonal distribution are deduced though studies throughout the year were not possible. Night observations are recorded in some detail and together with circumstantial evidence from other observations show that *A. jeyporiensis*, *A. minimus* and *A. leucosphyrus* are the important vectors if they attain sufficient abundance. *A. sundaicus* is also important ; *A. philippinensis* must be suspected and *A. hyrcanus* and *A. annularis* may be important locally under war conditions. Of the other species *A. aconitus* was found near man at night, though nearly all the freshly fed ones were taken near cattle ; *A. annularis*, *A. subpictus*, *A. vagus*, *A. barbirostris* and *A. jamesi* fed mainly or entirely on cattle.

A. philippinensis attacked people out of doors without resting near them and by so doing avoided surfaces treated with DDT and other contact insecticides. Cattle feeders entered houses at dawn to shelter for the day ; man-biters mainly sought shelter outside. The author stresses that to rely solely on searching for mosquitoes in houses in the daytime gives a false picture of the mosquito population and so far as malaria vectors are concerned, yields results which are valueless and even misleading. *H. S. Leeson*

EYLES, D. E. & YOUNG, M. D. **The Comparative Susceptibility of** *Anopheles albimanus* **and** *Anopheles quadrimaculatus* **to a South Carolina Strain of** *Plasmodium falciparum*. *J. Infect. Dis.* 1950, Sept.–Oct., v. 87, No. 2, 189–93, 3 figs.

The authors compare the susceptibility of laboratory strains of *Anopheles quadrimaculatus* and *A. albimanus* to a known strain of *P. falciparum* by a study of the infection rate for oöcysts on the twelfth day and the numbers of oöcysts per stomach for each species in a series of forty-seven experiments in which both species of mosquito were fed on the donor simultaneously.

A. quadrimaculatus developed an over-all infection rate of 58 per cent. (highest value, 88 per cent.) in 1,434 mosquitoes dissected and a mean oöcyst count of 38·5, while *A. albimanus* was considered less susceptible with corresponding values of 28 per cent. infected (highest rate, 69 per cent.) out of 1,398 examined and a mean oöcyst count of 15·5. The development of the parasite was also more rapid in *A. quadrimaculatus*.

The susceptibility of the mosquitoes appeared to affect the development of the parasite after the formation of the oökinete. *D. S. Bertram*

WHITE, R. A. Senior. **The Distribution of the Culicid Tribe Anophelinae around the Caribbean Sea.** *Caribbean Med. J.* 1950, v. 12, Nos. 3/4, 67–71. [23 refs.]

The author has compiled two tables, one showing the recorded distribution of forty-eight species of *Anopheles* in the Caribbean area and the other the geological surface changes from the Cretaceous epoch onwards.

Certain aspects of the recorded facts are brought out by these tables and merit further study by ecologically-minded entomologists. For instance, a gap in the distribution of *A. darlingi* in the southern half of Central America is not due to insufficient collecting and there is no question of its importation into the northern part of its range either by aircraft or by steamship. There is perhaps some ecological factor which prevents the two areas coalescing.

Notes are also given on *A. pseudopunctipennis*, the most widely distributed species in the New World ; on *A. vestitipennis*, *A. albimanus*, *A. argyritarsis* and on *A. aquasalis*. The geological surface changes are discussed in relation to the distribution of the anophelines of the islands. *H. S. Leeson*

DE ZULUETA, J. **Comparative Oviposition Experiments with Caged Mosquitoes.** *Amer. J. Hyg.* 1950, Sept., v. 52, No. 2, 133–42. [15 refs.]

Oviposition by females of *Anopheles darlingi* is greatly influenced by physical, particularly visual, factors, whereas *Culex fatigans* reacts most strongly to chemical stimuli.

Careful experiments showed that *A. darlingi*, under conditions of constant bright light, invariably chose a pan with a dark bottom for oviposition in preference to a similar pan lined with a white tile. With reduced lighting 9 per cent. laid in the light pan, with greatly reduced lighting (so that the difference between the two pans could not be detected by eye) female *A. darlingi* failed to distinguish between the two and in complete darkness oviposition was almost completely inhibited. If females were confined in small tubes in contact with wet paper in complete darkness 30 per cent. of them laid eggs, suggesting that the inhibitory effect of darkness in the previous experiment was due to their failure to locate the water. *C. fatigans*, however, failed to distinguish between the light and dark pans and 37 per cent. of them laid normal egg rafts in total darkness. Visual factors for this insect, therefore, are considered to be of secondary importance.

In similar trials in which water from different sources was used, *A. darlingi* was unable to distinguish between water from its preferred breeding sites and water from sites ignored by it in nature. This same species showed a certain preference for distilled water over 1 per cent. sodium chloride, a slight preference for plain water over 1 per cent. magnesium sulphate, a marked repulsion to

grass infusion and a still more marked reaction against water containing a liver preparation. *C. fatigans* on the other hand was completely repelled by sodium chloride, indifferent to magnesium sulphate and very strongly attracted to grass infusion and liver preparation. To test whether the effective stimulus for *C. fatigans* acted through scent or taste a Petri dish containing grass infusion was floated in a pan of rain water and set up as before. Egg rafts were laid in both the pan and in the Petri dish and it is suggested that the females were guided by scent to the grass infusion but that some of them inadvertently laid their eggs in the " wrong " part of the pan (*i.e.*, that containing rain water).

M. T. Gillies

LIPPI, M. La funzionalità renale nei malarici cronici. [**Renal Function in Chronic Malaria.**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1950, June, v. 31, No. 6, 407–21. [43 refs.] English summary (5 lines).

The renal function has been studied in 32 persons who were subject to chronic malaria, but in each of whom the last attack had occurred some months back. All these patients showed enlargement of spleen and liver, anaemia and a poor general state of health. None of them showed any evidence of other disease at the time nor gave any history of any past complaint which might have involved the kidneys. The blood nitrogen and the arterial blood pressure were determined in each case, and the ordinary urine tests were carried out under conditions both of " dilution " and of " concentration ".

For the " dilution " test, the subject was made to fast after supper and a specimen of urine was collected from him the next morning. A litre of water was drunk half-an-hour later and a series of 6 specimens of urine taken every half hour were thus obtained altogether For the " concentration " test, made a day or two later, the patient refrained from drinking any water or other fluids after breakfast ; a specimen of urine taken at noon was followed by a dry meal (bread, macaroni or other " dry paste ", fried potatoes, roast beef) and another dry meal was given at about 6 p.m., a series of 6 specimens being obtained every 2 hours between noon and midnight ; no drinks were allowed during these 12 hours.

The individual clinical findings are shown for 11 of these cases.

On the whole, the concentration test showed specific gravities which were at the lower end or below the normal range. All other findings in this investigation came within the normal range. A brief reference is made to relevant hypotheses put forward by other workers on the subject. *J. Cauchi*

CICCONARDI, A. Sulla parassitabilità dei reticolociti nell'infezione da *Pl. falciparum*. Confronti col comportamento del *Pl. vivax*. [**Susceptibility of Reticulocytes to Invasion by *P. falciparum* : Compared with their Behaviour towards *P. vivax*.**] *Acta Med. Italica.* 1950, Feb., v. 5, No. 2, 34–41. [50 refs.] English summary.

Films of blood were taken from 15 patients suffering from *P. falciparum* malaria during the first hour of the febrile attack. The number of reticulocytes varied from 0·12 to 1·5 per cent. of the total red cells, average 1·21 per cent. In only four patients were any parasites found in reticulocytes and then in insignificant numbers. The findings are in marked contrast with those of similar observations in *P. vivax* infections. The author discusses at great length the extensive literature concerned with the apparent partiality of *P. vivax* for reticulocytes. He considers that the phenomena observed are best explained by the emission into the blood-stream of erythrocytes that have been previously parasitized in the medulla. That this does not happen in *P. falciparum*

infections may possibly be due to several causes—" variations in the medullary threshold, differences in the rate of maturation of parasitized reticulocytes, and the ' alignment ' of the parasites." *Norman White*

HORMANN, H. Eine Methode zum serologischen Nachweis der Malaria. [**A Method for the Serological Diagnosis of Malaria.**] *Ztschr. f. Immunitätsf. u. Exper. Therap.* 1949, Apr. 15, v. 106, No. 2, 135–41.

This paper amounts to a general discussion of serum flocculation in malaria, with the use as reagents of Trensz's water soluble ox-eye melanin (a modification of Henry's method) and a preparation of iron albumin. Methods of preparation of the reagents are given in detail. The author concludes that these reactions are of little help in the diagnosis of latent or larval malaria or of relapses, since they disclose only gross changes in serum protein. On the other hand, the reactions do indicate the immune responses of individual subjects to infection and may therefore be useful in assessing prognosis. Various factors modifying the reactions are discussed, including the relation of the reactions to splenic enlargement (the flocculation is not always present with splenic enlargement, and *vice versa*) and the presence of exo-erythrocytic or asexual parasites.

The original should be read by those interested. *B. G. Maegraith*

PIZZILLO, G. Sindromi addominali acute da malaria (pseudo-colecistite—pseudo-appendicite). [**Acute Abdominal Syndrome in Malaria.**] *Riv. di Malariologia.* 1950, Oct., v. 29, No. 5, 315–20. [15 refs.]

The English summary appended to the paper is as follows :–

" Two abdominal syndromes, which were disguising their real entity, proved to be the result of malaria infection. An attack of acute suppurative cholecystitis and an acute appendicular attack have been unmasked by the synergic action of adrenaline-quinine, that virtually acted like a bistury. In both cases the malaria parasites resulted as the direct cause of the syndrome. To adrenaline is certainly due not only the therapeutic action, but also the mobilizing diagnostic action."

RIGDON, R. H. & BRESLIN, Dorothy. **Observations on the Effect of certain of the Antimalarial Drugs on Erythrocytes.** *Texas Reports on Biol. & Med.* 1950, v. 8, No. 3, 371–83. [59 refs.]

In spite of numerous investigations on the mode of action of antimalarial drugs it is still not clear whether it is direct on the parasite or whether it is indirect through its effect on the host cell. It is well known that some therapeutic agents do affect red cells, as evidenced by the appearance of methaemoglobinaemia and by morphological changes in the cells themselves. The authors have briefly surveyed the literature on the effects produced in erythrocytes by antimalarial drugs. The production of methaemoglobinaemia has been shown to occur after treatment with quinine, sulphonamides, methylene blue and in particular after pentaquine and pamaquin [plasmoquine]. MACKERRAS and ERCOLE [this *Bulletin*, 1949, v. 46, 700] suggested that quinine and atebrin [mepacrine] inhibited the metabolism of haemoglobin by the malarial parasite and *in vitro* they reduce the oxygen consumption of parasitized cells. Pamaquin and in lesser degree pentaquine reduce the oxygen-carrying capacity of the red cell, cause cyanosis and haemolytic reactions as well as the methaemoglobin production noted above ; in addition peculiar bodies are found in red cells after therapeutic doses. The results of COGGESHALL and MAIER [this *Bulletin*, 1942, v. 39, 397] indicated that treatment of malarial infection in monkeys

with sulphanilamide damaged the larger parasites (which consume more oxygen) to a greater extent than the ring forms. TALIAFERRO *et al.* [this *Bulletin*, 1945, v. 42, 449] noted that the antibiotic tyrothricin causes changes in parasitized and normal red cells and induces haemolysis roughly proportional to its concentration. It is apparent, therefore, that the mode of action of antimalarials may be in part indirect. *J. D. Fulton*

BRITTO, R. S. & COTRIM, J. Observaçoes sôbre o tratamento da malária pela cloroquina em Porto Velho—Guaporé. [**Treatment of Malaria with Chloroquine in Porto Velho.**] *Rev. Serviço Especial de Saúde Pública.* Rio de Janeiro. 1949, July, v. 2, No. 3, 869–84. English summary.

In 1947–48, 665 patients suffering from malaria were treated with chloroquine in Porto Velho, the capital of the federal territory of Guapore in West Brazil. Patients were of both sexes and all ages. The infections were *P. vivax* 266, *P. falciparum* 295, *P. malariae* 68, mixed infections 36. Tablets of chloroquine diphosphate were used, each containing 0·15 gm. base. The maximum total dosage for well-developed adults was 1·5 gm. base, in divided doses. For children the total dose approximated 0·024 gm. per kgm. of body weight. The drug was given by mouth after food : it was well tolerated. Itching and nausea were occasionally noted but in no case had the treatment to be suspended. Clinical symptoms were controlled within 24 to 48 hours of the beginning of treatment. The only death in this series of cases was that of a child who had been in a state of coma for two days before arriving at hospital. *Norman White*

PENIDO, H. M., DE SOUSA, E. F. & BEZERRA, F. P. G., Jr. Estudo sôbre a ação de novas drogas antimaláricas no Vale do Rio Doce. [**Study of the Action of New Antimalarial Drugs in the Rio Doce Valley.**] *Anais VI Congr. Brasileiro de Hig., Rio de Janeiro, 19 a 25 Outubro, 1947.* 251–61, 1 map.

This is a report of a comparative trial of camoquin, chloroquine, oxychloroquine and paludrine [proguanil] in the treatment of malaria in the Rio Doce Valley. The adult dose of all four drugs was 1·0 gm. At first this was given as two doses of 0·5 gm. each, separated by an interval of six hours. When the innocuity of the drugs became evident a single-dose treatment was substituted. Cases of malaria were few where the observations were begun : residual DDT house spraying had been done in the region. Later the treatment was extended to the lower reaches of the river in the State of Espirito Santo where DDT had not been used, but even so the total number of cases treated was not large enough to justify conclusions as to the relative efficacy of the four drugs. Paludrine appeared to be the least effective of the four. The other three gave remarkably good results. *Norman White*

MEIN, R. M. & ROSADO, P. N. S. Experiência com novos medicamentos contra a malária no programa da Amazônia. [**Experimental Use of New Antimalarial Drugs in Amazonia.**] *Anais VI Congr. Brasileiro de Hig., Rio de Janeiro, 19 a 25 Outubro, 1947.* 263–90, 2 charts.

The observations described were carried out in hospitals in Belém and Santarem, Amazonia. Nearly all the patients were in hospital. In all cases the diagnosis of malaria was confirmed by blood examination before treatment. Of the 96 patients treated, 61 had *P. vivax* and 35 *P. falciparum* infections. Primary infections, relapses and chronic cases were all represented. For the most part the patients were suffering from other pathological conditions as well

as malaria, *e.g.*, amoebiasis, intestinal helminths, anaemia, malnutrition, etc. Thick blood smears were examined daily : after three consecutive negative examinations following treatment an intramuscular injection of adrenalin was administered. If the films taken 30, 45 and 60 minutes after this injection were also free from parasites the patient was considered cured of his malaria. Fifty-four patients were treated with CAM-AQI (single dose 0·5 gm. or 0·4 gm. for adults) ; 20 patients with chloroquine (total dose [whether base or salt not stated] 1·5 gm. in 4 days for adults) ; 7 patients with paludrine [proguanil] (0·8 gm. in 4 days for adults) ; 15 patients with oxy-chloroquine (1·5 gm. in 4 days for adults). The conclusions were : Chloroquine failed in 90 per cent. of *P. falciparum* infections, paludrine in 75 per cent., CAM-AQI in 8 per cent., and oxychloroquine in one case. All four drugs were very effective against *P. vivax* infections but preference is given to CAM-AQI in virtue of the more rapid disappearance of fever and parasites and amelioration of symptoms that followed its use. It is non-toxic, there are no contra-indications to its use and it is effective when given in a single dose. *Norman White*

PAULSHOCK, M. & MOSER, C. M. **Naphthoquinone Antimalarials. XXV. Naphthoquinones with Oxygen in the Side Chain.** *J. Amer. Chem. Soc.* 1950, Nov., v. 72, No. 11, 5073–7. [Refs. in footnotes.]

VISWANATHAN, D. K. **Malaria and its Control in Bombay State.**

This book is reviewed on p. 305.

LUDVIK, G. F. **Barrier Strip and Pre-Flood Treatments with DDT to control** *Anopheles quadrimaculatus*. *J. Econom. Entom.* 1950, Aug., v. 43, No. 4, 516–19, 1 fig. [11 refs.]

A new method of approach to the control of mosquitoes is the spraying of a strip of vegetation around human settlements and mosquito breeding grounds. Mosquitoes which succeed in crossing such a barrier must return to breed and larval population would decrease. A knowledge of height and speed of flight enables an effective width to be sprayed, with the use of an insecticide of high toxicity and low repellency. MADDEN *et al.* (*Mosquito News*, 1945, v. 5, 100) showed this to be a potentially effective method, causing a 57 per cent. reduction in population of *Aëdes*, by spraying a 100 ft. strip with DDT at 10 gallons an acre. Present tests were carried out on an area of 22 acres of high anopheline breeding almost surrounded by a dense vegetation border. A strip of this, 50 ft. wide and 10 ft. high was treated with heavy spraying equipment at the rate of 280 mgm. /DDT sq. ft. This dose assumed the area of foliage to be five times that of the ground. Of dyed *Anopheles quadrimaculatus* set free within the area 0·12 per cent. were recovered, compared with an average of 7 per cent. at previous tests. This shows an immediate reduction, although the percentage recovery falls within the lower limit of that for an untreated area.

A 20 per cent. solution of DDT was applied in April by air at the rate of 1·4 lb. per acre to a swamp area of high anopheline breeding, previously untreated for two years. The mortalities of larvae introduced into the area showed insecticidal activity, effective for three weeks, although older larvae were little affected after 4½ days. Sampling showed that larval development was retarded for seven weeks and that the adult population did not increase until the ninth week after treatment ; it is suggested that pre-flooding treatment retarded the initial adult peak population for five weeks. *R. Nash*

CORRÊA, R. R. Sôbre a verificação da incidência de malaria nas areas dedetizadas. [**Check of Malaria Incidence in Areas in which DDT Residual Spraying has been used.**] *Anais VI Congr. Brasileiro de Hig., Rio de Janeiro, 19 a 25 Outubro, 1947.* 405–20, 9 figs.

In certain parts of Brazil the density of anopheline infestation, notably that of *Anopheles darlingi*, is subject to remarkable variations, caused apparently by changes in meteorological conditions. This was notably the case in the State of São Paulo, where the author has done much work. Here he has noted the spontaneous disappearance of that species from certain localities. Certain control observations are therefore necessary before one is enabled to attribute the decline in malaria incidence to the operation of such control measures as DDT residual spraying. Such observations include the search for adult mosquitoes inside and around dwellings and in animal houses and mosquito traps. The author describes, with illustrations, the construction of SHANNON's "Dawn Trap", which has been used with success in Trinidad, and recommends its use. *Norman White*

EYLES, D. E. **A Stain for Malarial Oocysts in Temporary Preparations.** [Research Notes.] *J. Parasitology.* 1950, Oct., v. 36, No. 5, 501.

The author found that counting of oöcysts of *Plasmodium gallinaceum* in *Aëdes aegypti* was facilitated by the use of 2 per cent. Mercurochrome solution. Mosquito guts were placed in saline on a slide and a small drop of the dye solution was added : the proportion of the dye solution could be varied considerably and there was some latitude in the time of staining. Usually the preparation was allowed to stand "for a few minutes" before a coverslip was placed upon it.

In practice, several guts were placed in one drop of saline, and those which were not examined at once after staining were kept for a time in saline without dye.

Guts so stained showed more or less deep red oöcysts, without marked staining of the mosquito tissue. When eosin was applied similarly the gut tissue was more frequently stained, so that Mercurochrome was superior. The method was found satisfactory from 4 to 9 days after the mosquitoes had been fed, with subsequent incubation at 75° to 80°F. The staining of the oöcysts made it possible to count them under lower magnification than otherwise, *viz.*, about 150 magnifications (16 mm. objective with ×15 ocular).

H. J. O'D. Burke-Gaffney

GRANT, Jean S. **Acquired Resistance to Chlorguanide in the Pigeon Strain of *Plasmodium relictum* (Grassi and Feletti, 1891).** *J. National Malaria Soc.* 1950, Sept., v. 9, No. 3, 234–8.

Acquired resistance to chlorguanide [paludrine, proguanil] has been described in a number of plasmodia including *P. gallinaceum*, *P. lophurae* and in human strains [this *Bulletin*, 1947, v. 44, 969, 970 ; 1949, v. 46, 446, 609].

It has now been shown that resistance to this drug can be produced in *P. relictum* in the pigeon, by the usual method of giving sub-curative doses. In the experimental birds infection was produced by intravenous inoculation of parasitized blood. Intravenous injection of 1 to 2 mgm. of the drug on the day of infection and the following day was carried out during the first few passages. Thereafter the dose was increased slightly and was continued for 3 days starting with the appearance of parasites in the blood. At the end of

15 serial passages there was no evidence of acquired resistance. Treatment was continued orally and after 3 passages some evidence of resistance was obtained. At the end of 27 passages in the birds treated orally a total dosage of 8 mgm. chlorguanide given orally or intravenously did not reduce the parasitaemia in the treated strain but suppressed the normal strain. When 9 birds with latent infections of the normal strain were inoculated with the now resistant strain only 2 showed patent infections after 48 hours. From the results the author concluded that the immunological characters of the resistant strain were not different from those of the normal strain. *J. D. Fulton*

TRYPANOSOMIASIS

SAUNDERS, G. **Human Trypanosomiasis in the Gold Coast.** 1947, Feb. 28, 81 mimeographed pp. [5 pages of refs.]

This is a full and interesting account of the Gambian form of sleeping sickness based on the author's experience in the Gold Coast Territories. All aspects of the disease are dealt with and numerous references and quotations from the work of others are given ; the bibliography contains nearly 200 references, many of which are to summaries in this *Bulletin*. The subject is discussed under the following headings : History, Trypanosomes, Transmission, Vectors, Epidemiology, Statistics, Immunology, Pathology, Incubation, Symptoms, Diagnosis, Laboratory Animals, Classification of Cases, and Treatment. Special attention is given to epidemiology and to the clinical side, the notes on cases being particularly interesting ; treatment with drugs is considered in detail and the techniques used in diagnosis and treatment are fully described.

[A few comments may be offered : on p. 4 the author writes " *T. rhodesiense* infects man but loses its power to do so after a few passages through animals ; *T. gambiense* retains its power to infect man after many passages through animals (Yorke, Adams and Murgatroyd, 1930) " ; the work done at Tinde contradicts the former statement. On p. 34 it is stated that *Cercopithecus* monkeys are not uncommonly found naturally infected with trypanosomes ; the reviewer thought that natural infection of these monkeys was very rare. Natural infection of *C. aethiops* with *T. brucei* in Portuguese Guinea was, however, recently reported by FERREIRA [this *Bulletin*, 1949, v. 46, 530] ; its importance in relation to the experimental use of local monkeys is obvious. On p. 35 the sentence " I advise using aseptic technique in lumbar puncture " might well have been expressed more strongly. The author's view that a case without somnolence and with normal protein content of the cerebrospinal fluid does not require tryparsamide if the cell-count is under 30 per cmm. is interesting ; the protein figure is regarded as very important, as it is also in Rhodesian sleeping sickness, but in the latter a cell-count of over 3 per cmm. is at least suspicious. The difference between the two forms is further shown by the author's estimate (p. 72) that about 70 per cent. of his advanced cases, efficiently treated, are cured.] *J. F. Corson*

MAILLOT, L. Migrations saisonnières de *Glossina palpalis* aux environs de Brazzaville. [**Seasonal Movements of** *G. palpalis* **in the Brazzaville Neighbourhood.**] *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 9/10, 625–31, 3 figs.

The paper discusses the numbers of *Glossina palpalis* captured close to Brazzaville, French Equatorial Africa, throughout one year.

There is a narrow zone of "gallery forest" along the bank of the Congo. Game animals are absent and man is almost the only host of the tsetse except in one spot where crocodiles occur. The numbers of *G. palpalis* captured are very low, generally about six per boy per day. The proportion of females captured appears to vary with the season, being high at the end of the rains. In the author's view, this is due to "massive migrations", the males moving more freely than the females, especially in the dry season. It does not seem that this view is well supported by the facts, and we suggest that the samples captured are by no means representative of the wild population of flies : such samples are generally not representative. The proportion of females which attack man is perhaps influenced by climatic factors.

Captured tsetse have been kept alive for as long as sixty-five days. The puparia are very difficult to discover in nature.

Some 3,000 dissections have been made and salivary infections discovered in 0·8 per cent. In the absence of game and cattle this may reasonably be regarded as due to *T. gambiense*. No infections of *T. vivax* and *congolense* were discovered in the proboscis.

The specimens of *G. palpalis* belong to a peculiar form or sub-species which will require further study. *P. A. Buxton*

TRINCÃO, C. & DE GOUVEIA, E. O quadro hemático e medular na doença do sono. [**The Blood and Bone Marrow Pictures in Sleeping Sickness.**] *Anais Inst. Med. Trop.* Lisbon. 1950, July, v. 7, 61–115, 31 figs. (12 on 6 pls.). [47 refs.]

The English summary appended to the paper is as follows :—

"The authors studied 32 patients with sleeping sickness, in the different stages of the disease, most of which were simultaneously infested by hookworms.

"Sleeping sickness by itself causes a moderate normochromic microcytic anemia with a normal or increased serum iron level and an increased hemoglobin metabolism. Leucocytes are normal in number, or moderately increased and besides an eosinophilia attributable to hookworm infestation, there is neutropenia with monocytosis. Blood platelets are normal in number.

"The bone marrow picture demonstrates besides an erythroblastic proliferation, which reverses the normal leuco-erythroblastic ratio, plasmocytosis and a great number of megakaryocytes which show maturation arrest.

Total serum proteins stay between normal levels, but globulins are increased which explains the positivity of Napier's and Henry's reactions, the increased sedimentation rate of the erythrocytes and the auto-agglutination of red blood cells described in the disease."

ZSCHUCKE, J. Einige Stoffwechseluntersuchungen bei Schlafkrankheit. [**Metabolism in Sleeping Sickness.**] *Ztschr. f. Immunitätsf. u. Exper. Therap.* 1950, Jan. 7, v. 107, Nos. 1/2, 90–95. [13 refs.]

Sugar maintains the vitality of trypanosomes *in vitro* but its influence in sleeping sickness is disputed. The author therefore estimated the sugar content of the blood and cerebrospinal fluid in Africans with sleeping sickness and in healthy Africans as controls ; he also estimated the vitamin C content of these body fluids and the vitamin C deficit and maintenance dose in infected and healthy Africans. The work was done in 1938–1940 in the island of Fernando Po. The cerebrospinal fluid showed no difference in the two groups but the blood sugar was less in the infected group, especially in the early stage. The author quotes contrary findings of other workers and refers to his own experiments in animals in which the injection of glucose was not followed by increase

in the number of trypanosomes in the blood and injection of insulin did not cause a decrease. The saturation deficiency and maintenance dose of vitamin C were much higher in the late stages of sleeping sickness but both the groups of Africans showed much the same figures for vitamin C content of the blood and cerebrospinal fluid respectively. The higher figures in Africans as compared with healthy Europeans are attributed to the high content of ascorbic acid in the fruit and vegetable diet of the former.

In the last stage of sleeping sickness, where all food is badly absorbed and used, very large doses of ascorbic acid, parenterally and orally, were tried without success. Vitamins A and B_1 also failed to relieve optic atrophy due to atoxyl, and other nervous symptoms.

The author concludes that the use of sugar by *T. gambiense* has no special importance in sleeping sickness, but the disturbance of vitamin metabolism, especially vitamin C balance, is more important although the administration of vitamins in large doses had little effect. [For early work see *Sleeping Sickness Bulletin*, 1911, v. 3, 470 ; 1912, v. 4, 63 ; for recent work see this *Bulletin*, 1948, v. 45, 495, 773 ; 1949, v. 46, 914, 918 ; 1950, v. 47, 218, 447.]

J. F. Corson

STEPHENS, F. F. & WIBBERLEY, D. G. **Some Potential Trypanocidal and Antibacterial Compounds in the Heterocyclic Series. Part I. Benzthiazoles.** *J. Chem. Soc.* 1950, Nov., 3336–40.

BOWER, J. D., STEPHENS, F. F. & WIBBERLEY, D. G. **Some Potential Trypanocidal and Antibacterial Compounds in the Heterocyclic Series. Part II.** *J. Chem. Soc.* 1950, Nov., 3341–4.

ENOS, W. F. & ELTON, N. W. **Fatal Acute Chagas' Disease in a North American in the Canal Zone.** *Amer. J. Trop. Med.* 1950, Nov., v. 30, No. 6, 829–33, 3 figs.

" An 18 year old white American soldier, stationed in the Canal Zone, entered the hospital because of cellulitis of the left foot. After running a relapsing type of fever, he went into sudden shock on the 43d hospital day, expiring three days later. Laboratory work was non-contributory except for the heterophile antibody reaction performed on the 22d day of observation, which was positive to 1/1024 dilution. Absorption tests with boiled guinea pig kidney after death proved the antibodies to be of the Forssman type.

" Autopsy disclosed a myocarditis associated with parasitization of the heart muscle by the leishmanial forms of the *Trypanosoma cruzi*. The immediate cause of death was congestive heart failure in acute Chagas' disease."

PERRIN, Margarita. Nota previa sobre el aislamiento y cultivo en Mexico de un schizotripanum. [**A New Trypanosome from Mexico.**] *Medicina.* Mexico. 1950, June 25, v. 30, No. 606, 245–7.

Description of a trypanosome isolated in culture from the blood of a rat experimentally infected with the faeces of a Triatomid bug obtained in Mexico. The parasite was similar to *Trypanosoma cruzi*, except for minor differences in its behaviour in culture and its movements. On this account the author proposes to name this flagellate *Schizotrypanum mexicanii* [= *T. mexicanii*]. [The grounds for creating a new species for the trypanosome of Mexican rats appear to be very slender.]

C. A. Hoare

HOARE, C. A. **Akinetoplastic Strains of *Trypanosoma evansi* and the Status of Allied Trypanosomes in America.** Reprinted from *Rev. Soc. Mexicana de Hist. Natural.* 1949, Dec., v. 10, Nos. 1/4, 81–90. [18 refs.]

A review of the incidence and possible significance of loss of the kinetoplast (parabasal body) in trypanosomes, a subject to which the author has given much attention during the last thirteen years. He believes that *Trypanosoma equinum* has arisen from *T. evansi* by the loss by the kinetoplast of the power to divide, resulting in progressive preponderance of akinetoplastic forms and finally total absence of the kinetoplastic forms. The relationship of *T. hippicum* and *T. venezuelense* to *T. evansi* is also referred to. [See this *Bulletin*, 1928, v. 25, 800; 1937, v. 34, 531; 1939, v. 36, 205; 1940, v. 37, 710; 1941, v. 38, 314; 1942, v. 39, 233; 1944, v. 41, 150; 1948, v. 45, 504.]

J. F. Corson

FERREIRA, F. S. da C. & TENDEIRO, J. Sobre o tratamento das tripanosomíases dos animais pelo antrycide. [**The Treatment of Animal Trypanosomiasis with Antrycide.**] *Anais Inst. Med. Trop.* Lisbon. 1950, July, v. 7, 53–9.

The English summary appended to the paper is as follows :—

" This is a short note concerning the treatment of animal trypanosomiasis in Portuguese Guinea with Antrycide, using a dose of 5 milligr. per Kg. weight (Methyl sulfate dissolved at 10% in distilled water).

" Injections were given to 13 horned cattle, 7 horses and 1 donkey, all infected with trypanosomes, as follows : *T. congolense* (18 cases), *T. vivax* (1 case), *T. brucei* (1 case) and a case not definitely identified, probably *T. congolense.*

" The time during which the animals were under observation was from 6 to 9 months. All tests were negative after only one injection of Antrycide, and a marked improvement in the clinical state of the animals was registered, with the exception of one cow in a serious condition of *T. congolense*, which died 34 days after the injection, although the daily tests for trypanosomes in the blood were always negative.

" In order to establish the trypanocidal effect of Antrycide, it was used in experimental infections with *T. congolense* with the result that sterilisation of the blood was obtained within 24 to 48 hours after the injection, without a relapse in the time indicated above, although one dog, not treated, which constantly had trypanosomes in the blood, according to the daily tests, died after 30 days.

" Another dog, which received an injection of Antrycide, has not contracted trypanosomiasis and lived for 6 months after being inoculated with 5 cc. and re-inoculated (after 16 days) with 10 cc. of the blood of a dog with *T. congolense.*"

LEISHMANIASIS

FENDALL, N. R. E. **Kala-Azar in the Kitui Reserve.** *East African Med. J.* 1950, July, v. 27, No. 7, 291–6, 1 map.

Kala azar is endemic in the Sudan and cases have been reported as far south as the Northern Frontier District of Kenya. The author now records six cases in which the infection was apparently acquired in the Kitui Reserve at or near Ngomeni, at an altitude of 2,475 feet, on a sandy soil with rock out-croppings

and a scanty rainfall (15 to 20 inches annually). In addition to the six cases reported, two cases were found among 331 persons, on 115 of whom spleen punctures were performed, living in or near Ngomeni.

The author failed to find any cases of kala azar among 1,897 persons examined at other dispensaries in the Kitui Reserve. Kala azar has previously been reported from Garissa and Archer's Post and the author thinks it possible that the whole area between these three points is an endemic area ; on the other hand, he considers that it is more probable that there is a localized focus at Ngomeni started by African soldiers returning from service in areas where kala azar is endemic.

All six cases were parasitologically confirmed as kala azar. One patient died ; the remainder were cured. Two were given stilbamidine and two urea stibamine : the fifth patient received two courses of antimony, stibophen [why ?] and urea stibamine, and was eventually cured by a course of pentamidine. *L. E. Napier*

ROW, R. **Symbiosis in Microbic Cultures.** *Indian Physician.* 1950, Nov., v. 9, No. 11, 301–3.

Studies in symbiosis between *Leishmania* and *Myco. tuberculosis* [see also this *Bulletin*, 1949, v. 46, 264, 1054].

LIPPI, M. & TRIPODI, P. Osservazioni e considerazioni sulla curva termica nella leishmaniosi viscerale. [**The Temperature Chart in Visceral Leishmaniasis.**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1950, Aug., v. 31, No. 8, 555–63, 5 folding figs. [26 refs.] English summary (2 lines).

Quotations from, and references to, literature on the types of temperature recordings in kala azar indicate that these types are some half a score in number. The authors mention Brahmachari's division into 11 types and Girolami's 5 groups with subdivisions. The latter is more comprehensive, or at least more subdivided. 1. With febrile exacerbations ; simple isolated attacks or intermittent twice or thrice daily, or once daily on alternate days, or on every 4th or 5th day. 2. Protracted fever, continued or remittent, with one or more accessions daily, a saddle-back chart with undulant or relapsing types. 3. With slight accesses (febricula) to 37°–38°C. 4. Irregular temperature. 5. No rise, temperature sub-normal.

The authors have studied 52 cases, taking the temperatures every 3 hours, day and night. In six, the fever was periodic and there might be several days, from 3 to 12, without any rise of temperature ; in 20 the type was a daily remittent with, at times, two accessions in the day, lasting usually 3–4 hours, occasionally longer, 8–9 hours ; in 11 it was remittent with one or two accessions during the day. Several charts are reproduced. The authors conclude that there is no characteristic chart in kala azar ; the temperature may vary in type with periods of apyrexia and the general type may be intermittent or remittent with one or more rises daily. *H. Harold Scott*

CHUNG, Huei-lan, CHANG, A., CHANG, Nai-ch'u, FENG, Shui-lien, LU, Jui-ping & TSAO, Yu-pu. **The Efficacy of Penicillin in the Treatment of Noma occurring in Kala-Azar Patients.** *Chinese Med. J.* Shanghai. 1949, Sept., v. 67, No. 9, 469–73.

Cancrum oris, or noma, is probably the most fatal of the complications of kala azar. While it has been shown that penicillin is useless against the *Leishmania* infection, it helps to control the secondary infection in cutaneous

leishmaniasis and has been successfully used in the treatment of cancrum oris [SEN GUPTA and CHAKRAVARTY, this *Bulletin*, 1945, v. 43, 833] in visceral leishmaniasis.

The authors report a series of thirteen cases of cancrum oris treated successfully by penicillin. There were no deaths ; healing occurred in twenty-four hours to eighteen days with little resulting disfigurement. The antibiotic had no effect on the *Leishmania* infection even after total doses of 1,000,000 to 3,350,000 Oxford units, and in every case the routine anti-kala-azar treatment had to be given as well ; there was, however, a general improvement in nine out of the thirteen cases. The total dose given was as low as 150,000 units in one case and in eight cases it was below 1,000,000 units : the penicillin was given intramuscularly in the usual doses at intervals of three to four hours. [The use of penicillin constitutes a very great advance in the treatment of this very distressing complication of kala azar.] *L. E. Napier*

SCHMIDT, F. R. **Favorable Effect of High Altitude on American Cutaneous Leishmaniasis and Leprosy.** *Arch. Dermat. & Syph.* 1950, June, v. 61, No. 6, 984–92, 6 figs. [10 refs.]

There are two well recognized forms of cutaneous leishmaniasis in South America, namely, uta, a benign form similar to oriental sore, in which there are no secondary mucosal lesions ; and espundia, or muco-cutaneous leishmaniasis in which in 20 per cent. of cases ulcerating and mutilating lesions develop in the mouth and nose at a later date. Uta occurs in the high arid valleys of the Andes at altitudes of 3,000 to 8,000 feet, whereas espundia is found in the tropical forests of Peru. In neither form does the disease tend to spread and in both, the lesions tend to heal rapidly at high altitudes. This is also true of leprosy.

The explanation lies, so the author thinks, in the altered biochemical status of the invading parasite, and not in the reaction of the host tissues to high altitude. SOULE and MCKINLEY [this *Bulletin*, 1933, v. 30, 238] observed that the organism which they thought was *Mycobacterium leprae* developed well in an atmosphere of 40 per cent. oxygen but much less favourably when the oxygen was reduced. *Myco. leprae* is deficient in cytochrome oxidase. When *Myco. leprae* is exposed to the lower oxygen tension of a person living at a high altitude its enzyme system cannot cope with the unfavourable environment. The disease is arrested because the invading organism has been weakened. In leishmaniasis the stability of the hydrogen-ion concentration is easily upset. [The reviewer is here quoted, but it should be pointed out that he was referring to visceral and not to cutaneous leishmaniasis, in which similar blood changes have never been demonstrated.] The oxygen deficiency causes an increase in the acidity of the tissues which is inimical to the invading organisms.

Suggestions are made for producing artificially the same effects on the patient as does high altitude, by way of treatment in these two diseases.

[This is a purely theoretical study, based very largely on insufficient premises.]

L. E. Napier

FEVERS OF THE TYPHUS GROUP

GIROUD, P. Une mission scientifique au Moyen Congo, en Oubangui au Ruanda-Urundi, au Katanga en Afrique du sud. [**A Scientific Mission to the Middle Congo, Oubangui, Ruanda-Urundi, Katanga and South Africa.**] *Rev. Colon. de Méd. et Chirurgie.* Paris. 1950, Nov. 15, v. 22, No. 184, 352–8.

At Brazzaville in the Middle Congo, the author studied several cases of "Congolese red fever". In eight of these cases of exanthematic fever lasting 8–11 days the common features were—a macular, sometimes slightly papular, rash ; a small local ulcer or *tache noire* ; and in most of the cases a history of a previous excursion into the wilds or of residence in houses close to waste land. Sera of two of the patients agglutinated *Rickettsia conori* ; in another case murine and Q-fever rickettsiae were agglutinated. Six sera gave a Weil-Felix reaction (1–100) with *Proteus OXK* and *Pr. OXL.* More than 100 mice and guineapigs were inoculated with blood of the patients, without result, and inoculation of animals with suspensions of more than 2,000 ticks also gave negative results. The author's "supersensitivity test" was carried out with the sera of five Europeans who had suffered from the same kind of fever ; the antigens used were epidemic, murine and scrub typhus, boutonneuse fever and Q fever. All gave definite reactions pointing to boutonneuse fever and, to a less degree, to murine typhus ; one reacted also with Q-fever antigen : none reacted with scrub-typhus antigen.

At Oubangui, tests were carried out on 58 members of a tribe whose custom was to spend four months every year in catching wild rodents ; 49 reacted with murine antigen, 42 with boutonneuse antigen and 10 with Q-fever antigen.

At Ruanda-Urundi in the Belgian Congo, at altitudes of 1,800 to 2,000 metres, a high percentage of persons associated with cattle gave fixation reactions with Q-fever antigen and so did a large proportion of the local cattle, sheep, goats, horses, dogs and pigs. All the animals were heavily infested with ticks, from some of which and also from the milk of cows *Rickettsia burneti* was isolated. Lice were abundant, and in one area *R. burneti* was isolated from them.

Positive complement-fixation reactions with scrub-typhus antigen were observed among the indigenous population of Ruanda and also among "Hindus" who came from Horbasse to trade with the people.

[Details of this interesting observation would be welcomed in view of the doubts that have been expressed with regard to the occurrence of mite-borne typhus in Africa.] *John W. D. Megaw*

PRZESMYCKI, F., WOJCIECHOWSKI, E, & MIKOLAJCZYK, E. **The Effect of Aureomycin on *Rickettsia prowazeki* in the Intestines of Body Lice.** *Canadian J. Comp. Med.* 1950, Oct., v. 14, No. 10, 325–30.

The authors employed the technique of Weigl for the intrarectal introduction of *Rickettsia prowazeki* and solutions of aureomycin into the intestines of laboratory-reared lice. They found that solutions of the drug at a strength of 0·01 per cent. given at intervals of 24 to 48 hours inhibited the growth of the rickettsiae but were not lethal to them ; after interruption of the treatment the organisms again multiplied and eventually killed the lice.

When stronger solutions, 0·05 per cent., were given three hours after infection and thereafter at intervals of 24 hours, infection was prevented and apparently the rickettsiae were destroyed. *John W. D. Megaw*

MEYER, R. Zur Fehlergrösse des serologischen Fleckfiebernachweisverfahrens (Weil-Felix-Reaktion). I. Mitteilung. [**Errors connected with the Weil-Felix Test for Typhus Fever.**] *Ztschr. f. Immunitätsf. u. Exper. Therap.* 1949, Apr. 15, v. 106, No. 2, 89–110, 3 figs. [10 refs.] II. Mitteilung. *Ibid.* May 30, No. 3, 212–32, 1 fig. [10 refs.]

The author has made a close study of the various factors responsible for errors connected with the Weil-Felix test. The antigens tested were *Proteus X19* and *Pr. OX19* prepared in the usual way, and *Pr. OX19* in the dried form as employed by EYER and ROHRMANN in their "dry-diagnostic test". The dried antigen gave the most constant results and the *Pr. X19* was the least reliable. The addition of 0·06 to 0·015 per cent. of phenol to the serum increased the reliability of the findings. The degree of error observed amounted to one step up or one step down in the scale of titres.

Among the factors studied were the age and degree of humidity of the culture media employed, the density of the suspensions, the temperature maintained during agglutination and the length of the period that elapsed before the reading was made.

The paper is of special interest to laboratory workers; it will doubtless receive attention by the experts who are studying the problem of standardization of the antigens employed in the Weil-Felix test.

There is a useful summary of the literature of the subject.

John W. D. Megaw

MEYER, R. Ueber die Titerschwankungen bei fortlaufender Proteus X19 und OX19-Agglutination mittels menschlicher Fleckfieberseren. [**Variations in the Titres of Agglutination of *Proteus X19* and *Pr. OX19* by Sera of Typhus Patients.**] *Ztschr. f. Immunitätsf. u. Exper. Therap.* 1949, July 15, v. 106, No. 4, 298–312, 8 figs.

This is a description of a further study of the same subject as is dealt with in the above paper. A long series of Weil-Felix tests were carried out over a period of 204 days during which a constant vacuum-dried *Proteus OX19* antigen and a constant-titre agglutinating serum were employed. The tests were planned in such a way as to admit of an analysis of the factors responsible for variations in the results of the tests.

Among the more important findings were that errors due to differences in the methods employed could be reduced by 50 per cent. by using phenolized saline solutions, and that the range of inconstancy of the *Pr. OX19* antigens was 3 to 7 per cent. Flagella formation in *Pr. OX19* cultures caused a reduction of the titres. Cultures of *Pr. OX19*, when subcultured daily over long periods, were found liable to develop flagella and to give rise to "zones of disturbance" in the agglutination reactions. *John W. D. Megaw*

NINARD, B. Sur la valeur diagnostique pour les rickettsioses de l'agglutination du *Proteus OX19* en particulier chez la femme enceinte. [**The Diagnostic Value of the Weil-Felix Reaction, with special reference to Pregnant Women.**] *Bull. Inst. Hyg. Maroc.* 1949, v. 9, Nos. 3/4, 239–53, 1 graph.

The percentages of positive reactions with *Proteus OX19* at certain titres among 1,378 pregnant women, 286 non-pregnant women, and 515 men are shown in the following table. The pregnant women were attending pre-natal clinics, the non-pregnant women and the men were patients of dermato-venereological dispensaries. All the persons were inhabitants of Rabat in Morocco.

	Weil-Felix Reactions		
Titres of reaction	1–80	1–160	1–320 and over
Pregnant women, percentage positive	18·72	2·17	0·79
Non-pregnant women, percentage positive ...	4·54	3·14	2·79
Men, percentage positive	1·74	1·16	7·18

The titre of 1–80 is regarded as non-specific, that of 1–160 is described as "critical" and the higher titres are considered to be specific, but the author points out that these designations are applied purely as a matter of convenience and are not intended to be taken literally. The figures showing percentages of positive reactions at 1–80 and 1–160 do not include persons positive at higher titres. [See also this *Bulletin*, 1949, v. 46, 538.]

John W. D. Megaw

VELASCO N., F., ONETTO S., R. & ESCOBAR L., P. Consideraciones sobre cien casos de tifus exantematico. [**A Study of 100 Cases of Exanthematic Typhus.**] *Rev. Med. Valparaiso.* 1948, Aug., v. 1, No. 3, 97–103.

D'IGNAZIO, C. Il convalescente dermotifoso. [**The Typhus Convalescent.**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1950, Aug., v. 31, No. 8, 545–54. English summary (5 lines).

The author insists that the convalescent stage of typhus fever ought to be regarded as the post-febrile period of the illness and that patients should be kept under close observation for at least two weeks after defervescence.

The numerous morbid conditions that persist after the end of the febrile stage are discussed ; most of these are due to damage of the circulatory and nervous systems. The need for special care is all the greater because the patient often looks well and feels well.

John W. D. Megaw

CATTAN, R., CARASSO, R., FRUMUSAN, P., COTONI, P. & WEILL-FAGE, J. C. Endocardite infectieuse et typhus exanthématique. A propos de deux cas nouveaux traités par l'auréomycine. [**Infectious Endocarditis and Exanthematic Typhus. Two More Cases treated with Aureomycin.**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1950, Nos. 29/30, 1473–9.

CHAMBERS, L. A. ; CLAWSON, Jean R. ; COHEN, S. S. **Studies on Commercial Typhus Vaccines. I. The Antigenic Constituents of Commercial Epidemic Typhus Vaccine** [CHAMBERS & CLAWSON]. *J. Immunology.* 1950, Nov., v. 65, No. 5, 451–7. [11 refs.] **II. The Antigenic Fractions of Disrupted Epidemic Typhus Rickettsiae** [CHAMBERS, COHEN & CLAWSON]. *Ibid.* 459–63. **III. The Concentration and Isolation of the Rickettsia-Specific Soluble Antigen of Commercial Typhus Vaccine** [COHEN, CHAMBERS & CLAWSON]. *Ibid.* 465–73. **IV. The Chemical Composition of the Antigens of Commercial Typhus Vaccine** [COHEN]. *Ibid.* 475–83. [33 refs.]

The purpose of the investigations described in these four papers was to provide a more potent epidemic-typhus vaccine than any available at present and to eliminate from yolk-sac vaccines substances capable of causing anaphylactic reactions.

The first paper contains a description of a method of obtaining a purified vaccine by differential centrifugation of commercial vaccines.

The purified *Rickettsia prowazeki* was found to be markedly specific when employed as an antigen in the complement-fixation test ; with the commercial vaccine the titres for murine and epidemic antisera were the same.

In the second paper, a method is described of disrupting the bodies of purified *R. prowazeki* by sonic vibration and then fractioning the fragments by differential centrifugation. Sediments subjected to proteolytic digestion were found to retain the complement-fixing activity of the original suspension, but there was an increased degree of cross-reactivity.

Various methods of concentrating the soluble antigens of commercial vaccines are described in the third paper. Material precipitated by Na_2SO_3 was found to be exceptionally pure and potentially adaptable for numerous practical purposes.

The fourth paper contains chemical data on the various types of rickettsial fractions isolated from the commercial vaccines. This paper is of a highly technical nature ; the "possibly practical significance" of the findings is discussed. *John W. D. Megaw*

ACTA MED. ITALICA. 1950, Sept., v. 5, No. 9, 285–91. Atti del I° Congresso della Società per lo Studio delle Malattie Infettive e Parassitarie. Roma, 27–28 ottobre 1949. Discussione sul tema di relazione sul tifo esantematico di genesi murina. [**Proceedings of the First Congress of the Society for the Study of Infectious and Parasitic Diseases. Discussion of the Relationships of Exanthematic Typhus of Murine Origin.**] [BETTOLO, M. ; BABUDIERI, B. ; SAGGESE, E. ; FRANZA, R. ; SCAFFIDI, V. (in reply).]

FOX, I. **The Brown Dog Tick on Rats in Puerto Rico.** *J. Econom. Entom.* 1950, Oct., v. 43, No. 5, 722–3.

Between January 1946 and March 1949, the author made a survey of *Rhipicephalus sanguineus* in 1,326 rats collected in two areas of the city of San Juan, Porto Rico, where this brown dog tick and murine typhus both commonly occur.

The first area, Santurce, was a residential one. Here, 938 rats were collected (809 *Rattus norvegicus*, 129 *R. rattus*). They came from the poorer residences and their surroundings. From 30 of these rats (2 *R. rattus*, 28 *R. norvegicus*) 35 brown dog ticks were obtained, giving an infestation rate of 3·2 per cent. and an average per rat of 0·037. The maximum number of ticks on a single rat was three, but rarely was more than one found on any rat. Only 5 of the 35 ticks were engorged. No statistically significant seasonal variation in number or infestation could be found.

The second area, San Juan proper, is a business district. Here 388 rats were collected (354 *R. rattus*, 34 *R. norvegicus*). They came from restaurants and similar establishments. Only two were infested (both *R. rattus*) and each had one tick, which in one case was engorged. The infestation rate was only 0·5 and the average number per rat 0·005.

It seems that *R. sanguineus* affects rats only to a minor degree and it is considered unlikely that it could play a significant part in the transmission of murine typhus in Porto Rico.

The author adds that rats have not hitherto been recorded as hosts of *R. sanguineus* in Porto Rico. *H. J. O'D. Burke-Gaffney*

FARINAUD, M. E., LÉVY, G. & FRÉZIÈRES, H. La chloromycétine dans le traitement du "Scrub-typhus" en Indochine. [**Chloromycetin in the Treatment of Scrub Typhus in Indo-China.**] *Méd. Trop.* Marseilles. 1950, May–June, v. 10, No. 3, 511–29, 8 charts.

A detailed description, illustrated by temperature charts, is given of 7 cases of scrub typhus treated with chloromycetin, given by the mouth in initial doses

of 3·0 gm. followed by divided doses amounting to 3·0 gm. daily, up to a total of 10 to 12 gm.

Treatment was started on the 6th to the 12th day. The results were dramatic ; the temperature became normal within 24 hours and the condition of the patients improved to a remarkable degree. In one case the treatment, started on the 9th day, caused a sudden fall of temperature to subnormal and there was some prostration ; the authors suggest that the sudden destruction of large numbers of rickettsiae may have been responsible and that large initial doses may not always be desirable.

In a case not belonging to this series treatment by 6·0 gm. given in one day was found inadequate.

The drug caused no signs of intolerance. *John W. D. Megaw*

DE MAGALHÃES, O. Subsídio para o melhor conhecimento do tifo exantemático neotrópico no Brasil. (Nota prévia.) [**Contribution to the Study of Neotropical Typhus in Brazil.**] *Brasil-Medico.* 1950, Sept. 2 & 9, v. 64, Nos. 35/36, 153, 1 fig.

DE MAGALHÃES, O. Emprêgo da " terramycin " no tratamento do tifo exantemático neotrópico no Brasil. (Nota prévia.) [**Terramycin in the Treatment of Neotropical Typhus in Brazil.**] *Brasil-Médico.* 1950, Sept. 16, 23 & 30, v. 64, Nos. 37/39, 175–6, 2 charts.

MARMION, B. P. & STOKER, M. G. P. **Q Fever in Great Britain. Epidemiology of an Outbreak.** *Lancet.* 1950, Nov. 25, 611–16, 2 figs. [13 refs.]

Brief preliminary accounts of this outbreak, which really consisted of two separate outbreaks, have already been reviewed in this *Bulletin*, 1950, v. 47, 226. The authors now give a more detailed description of the remarkably thorough investigation which they have carried out.

The two outbreaks occurred at the Royal Cancer Hospital, London, in June and July and in September, 1949, respectively.

The paper is of special interest and importance to medical men in Great Britain where, according to the authors, cases have already been detected in the counties of Kent, Devon, Gloucestershire, Wiltshire, Oxfordshire and Denbighshire.

There is little to add to the previous description of the first outbreak which consisted of five cases : the first patient was an old man who obviously became infected in N.E. Kent before admission to hospital ; the other four patients fell ill 17 to 19 days after contact with the dead body of the first patient either in the course of laying out the corpse or in carrying out an autopsy.

There was ample evidence of the existence of infection among cattle and human beings in the town in N. E. Kent where the first patient lived. The patient's wife was later found to have a high-titre positive reaction with the complement-fixation test and two out of eight persons employed in the dairy from which the family milk was obtained also had positive reactions, though at low titres. Six out of 19 persons employed at two other dairies reacted, two of them at a titre of 1–80.

Investigation of the cattle and employees at seven of the local farms revealed that infection had occurred in three of the farms. At one farm six of the 24 cows reacted and *R. burneti* was isolated from the milk of two of them. In another farm only one cow out of a herd of ten reacted but *R. burneti* was isolated from her milk ; both of the employees at this farm gave positive reactions.

The last case in the above outbreak occurred on July 13 and apart from the persons mentioned no other case occurred among the large number of members of the staff and others who came into contact with any of the patients.

Nearly two months later another "episode" occurred at the hospital; a physicist, working at an attached institute, and his wife, who had not visited the hospital for more than a year, were attacked on September 7 and 9 respectively with Q fever.

The astonishing feature of this episode was that it turned out to have no connexion with the previous outbreak. Both patients while on holiday in Devon had been guests of a local farmer between August 15 and 20 on several occasions and had been present at the birth of a calf whose dam was later found to be one of two cows that reacted with Q fever antigen; twelve other cows of the herd were negative. It was later found that a local resident who had also been present at the delivery of the cow was attacked on September 9 with "atypical pneumonia" which retrospectively was found to have been Q fever. Apart from these cases there was no other illness among the staff of the hospital up to January, 1950. The authors mention that sera from 300 cases of atypical pneumonia in London were all negative for Q fever.

John W. D. Megaw

STOKER, M. G. P. **Q Fever in Great Britain. The Causative Agent.** *Lancet.* 1950, Nov. 25, 616–20, 5 figs. (4 on pl.) [12 refs.]

Two British strains of *Rickettsia burneti* were thoroughly investigated: one was isolated from the blood of a pathologist who became infected through contact, in the post-mortem room, with the body of the first patient mentioned in the previous abstract; the other was isolated from a pool of milk collected from the three farms, also mentioned in the previous abstract. The strains were compared with each other and also with the well-known Henzerling strain isolated in Italy in 1946.

In their morphology, size, cultural features and immunizing properties the three strains were similar. Minor differences, of problematic significance, were observed; the British milk strain was more pathogenic for guineapigs and more readily adaptable to yolk-sac growth than the British human strain. Both of the British strains were less lethal to chick embryos than the Italian strain, even after they had become adapted to yolk-sac culture. Antigens prepared from yolk-sac cultures of the British strains in the early passages did not react when tested against homologous sera which reacted with the Henzerling antigen, but after several passages they began to react, though at lower titres than the Henzerling strain. Apparently some change took place in the antigenic structure of the rickettsiae during the adaptation of the organisms to yolk-sac culture.

John W. D. Megaw

HENGEL, R., KAUSCHE, G. A. & SHERIS, E. Über zwei dörfliche Q-Fieberepidemien in Baden. [**Two Village Epidemics of Q Fever in Baden.**] *Deut. med. Woch.* 1950, Nov. 10, v. 75, No. 45, 1505–7, 2 figs.

The first of the two epidemics described was in a village with a population of about 1,500 situated near Heidelberg. The inhabitants were mostly peasants or labourers who lived at some distance from their places of work. Between December, 1949, and April, 1950, there were about 150 cases, of which 100 were confirmed by complement-fixation tests.

An interesting finding was that *Rickettsia burneti* was isolated from five ticks (*Ixodes ricinus*) found on a dog which had just returned from straying in the country; the ticks had not fed.

There was clear evidence of contact infection in only one case.

In one household in which five exceptionally severe cases occurred three cows gave reactions at titres of 1–80 to 1–160. In a large establishment in which 14 attacks occurred within three weeks among 31 persons, 6 out of 35 cattle reacted at titres of 1–20 to 1–80 and *R. burneti* was isolated from the milk of two cows.

In the other epidemic, about 120 persons in a town with a population of 3,500 were attacked between May 15 and June 30, 1950. In this epidemic also the highest infection rate and the severest attacks occurred in a family whose cows were found infected 40 days after the outbreak ; *R. burneti* was isolated from the milk of three of the cows.

Both epidemics were thoroughly studied. The paper is illustrated by two electron-microscope photographs, at a magnification of about ×25,000, and by three ordinary photomicrographs. *John W. D. Megaw*

BRACHER, G. Über eine Q-Fieber-Epidemie in der SBB-Werkstätte Zürich-Altstetten. Beitrag zur Epidemiologie und Symptomatologie des Q-Fiebers. [**An Epidemic of Q Fever in the Zürich-Altstetten State Railway Works.**] *Praxis.* Berne. 1950, Mar. 23, v. 39, No. 12, 253–4, 1 diagram.

This epidemic of Q fever occurred in the months October, 1948, to February, 1949. Among a total of about 1,165 persons employed there were 90 cases of illness diagnosed as influenza, atypical pneumonia and other diseases of the kind. Complement-fixation tests were carried out on 60 of the patients, usually about five to seven weeks after the attacks. All the 14 positive reactions that occurred were among 475 persons employed in one section of the works which was situated near a yard in which wagons bringing cattle to a nearby slaughterhouse were washed down. The climatic conditions during the period were favourable to the formation of dust and it seemed likely that the source of infection was the inhalation of the infected dust particles.

Among 110 of the workers at the slaughterhouse 19 gave positive reactions and the proportion of positives was greatest among the persons who came into contact with living cattle. *John W. D. Megaw*

RANKING, D. L. **Q Fever. Serological Evidence of the Occurrence of another Case in South Africa.** *South African Med. J.* 1950, Dec. 2, v. 24, No. 48, 1006–7, 1 fig.

"The serological findings in this case are strong evidence that this patient had Q Fever, which was probably contracted from drinking infected milk.

"It is interesting to note the poor response to Chloromycetin in this case, for which no explanation can be given."

WEYER, F. Die Uebertragung des Q-Fiebers als zoologisches Problem. [**The Transmission of Q Fever as a Biological Problem.**] Reprinted from *Neue Ergebnisse u. Probleme d. Zool.* 1950, 1079–88.

Q fever differs from the other rickettsial fevers in that the infecting agent, *Rickettsia burneti*, can multiply in a number of different arthropods, such as mouse-fleas, bed-bugs, every species of tick that has yet been tested and even human body lice.

Ticks, however, are the most important vectors of infection among wild animals and are an important reservoir of infection because of their ability to transmit infection to their offspring through the egg.

The numerous warm-blooded animals susceptible to the disease can transmit infection to each other by infected sputum, milk or urine ; and these substances when dried and converted into dust may remain infective for long periods, chiefly through inhalation.

The author suggests that the special part played by the arthropod vectors may consist in the maintenance of the virulence of the rickettsiae for the warm-blooded hosts. *John W. D. Megaw*

MIRRI, A. La "febbre Q" negli animali in Sicilia e diagnosi allergica della "febbre Q" negli animali. [**Q Fever in the Animals of Sicily and the Diagnosis of the Disease in Animals, by an Allergic Test.**] *Ann. d. San. Pubblica.* Rome. 1950, May–June, v. 11, No. 3, 917–26, 2 figs. English summary.

The author had already employed with success an allergic test for brucellosis, in which a preparation called "Brucellini Mirri" was injected subcutaneously into one lower eyelid of the animal. The test for Q fever was carried out with the Lederle-Laboratories' antigen, titre 1–32, made from the Nine-Mile strain of rickettsia. The quantities injected were 0·2 cc. for sheep and goats, and 0·37 cc. for cattle. The reaction consists in a swelling of the lid on the 3rd or 4th day, reaching its maximum one or two days later, and persisting for a considerable time. The results of the test were quite definitely positive or negative. Comparative results of tests of the allergic and complement-fixation types are shown in the following table :—

	Number tested	Positive with both tests	Positive with C.-F. test only	Positive with allergic test only	Negative with both tests	Percentage of agreement
Goats ...	277	111	7	33	126	85
Sheep ...	44	18	3	1	22	91
Cattle ...	76	14	1	1	60	97

John W. D. Megaw

PLAGUE

WORLD HEALTH ORGANIZATION. TECHNICAL REPORT SER. NO. 11. **Expert Committee on Plague. Report on the First Session. Geneva, 19–24 September 1949.** 32 pp. Geneva. 1950, Oct. [1*s.* 6*d.* ; $0.20.]

The first session of the Expert Committee on Plague of the World Health Organization was held in September 1949 ; the report was published in October 1950.

The Committee, presided over by Sir Sahib Singh SOKHEY, recommended that the WHO should set up a team of experts, to work in collaboration with a local team provided by the government of a selected area, for the purpose of studying the problem of the locality, preparing a plan of work, setting in motion the machinery of investigation and control, and supervising the operations for five or six years.

The WHO team would consist of a medical epidemiologist and bacteriologist, an entomologist, a zoölogist, and a sanitarian.

The report contains a number of expressions of opinion by the Expert Committee on the subject of plague control.

An *endemic plague area* was defined as one in which domestic rodents and their ectoparasites form permanent reservoirs of plague owing to conditions which permit perpetuation of infection and from which human infection arises.

A *wild-rodent* or *sylvatic plague area* is one in which wild rodents and their ectoparasites form permanent reservoirs of plague due to conditions which permit perpetuation of infection.

It was stated that "streptomycin was proving the best therapeutic agent at present. It could abort pneumonic plague with a dosage of 15 gm. for a man of average weight."

For the protection of pneumonic-plague contacts daily doses of 3·0 gm. of sulphadiazine or sulphamerazine, for at least five days after the last exposure to risk, were recommended. Streptomycin was not considered suitable for this purpose because of its rapid excretion and the difficulty of repeated administration.

The measures of protection suitable for cities, seaports and airports are summarized ; chief emphasis is laid on the application of a 5·0 per cent. DDT dusting powder every six months or at intervals compatible with the maintenance of a flea index under 2, and on the use of the same powder for the protection of vehicles, aircraft, and the clothing and effects of passengers at the airports of departure from an infected area.

A great deal of useful information is contained in the four annexes to the report in which recommendations are made regarding the best technical methods for the identification of *Pasteurella pestis*, the examination of rats and their parasites and the use of insecticides and rat poisons. Formulae for the absolute rat-flea index and for estimating personnel on plague work are given and described in appendices. *John W. D. Megaw*

INDIAN RESEARCH FUND ASSOCIATION. REP. SCIENT. ADVISORY BOARD FOR YEAR 1949, 124–43. **Plague.**

At a meeting of the Plague Advisory Committee held in November 1949, the chairman, Sir Sahib Singh SOKHEY, was asked for a definition of pneumonic plague ; he said it was a highly infectious disease which occurred primarily as a respiratory infection as distinct from the secondary plague pneumonia occurring as a complication of bubonic plague.

Dr. A. M. FRANCIS reported that plague had occurred in 45 of the 468 villages in the Nilgiris which had been fumigated with Cyanogas every three or four months and in none of the 90 villages treated once by 10 per cent. DDT dust. In the latter villages the flea index remained under 1·0 for nearly 16 months after dusting. The cost of Cyanogas treatment was 2½ to 3 times higher than that of dusting. The chairman suggested that water-dispersible DDT would be more economical than dusting and pointed out that rat destruction by fumigation had the advantage of preventing loss of foodstuffs.

Dr. R. B. LAL referred to a few migration experiments in which rats marked by tattooing had been recovered 6 to 8 miles from the place of release.

John W. D. Megaw

CHITTY, D. & KEMPSON, D. A. **Prebaiting Small Mammals and a New Design of Live Trap.** Reprinted from *Ecology*. 1949, Oct., v. 30, No. 4, 536–42, 5 figs. [12 refs.]

This paper demonstrates that prebaiting techniques are effective with field voles (*Microtus agrestis*), wood mice (*Apodemus silvaticus*), bank voles

(*Clethrionomys glareolus*), and common shrews (*Sorex araneus*). It was found that, with live traps, a greater catch is obtained on the second time of setting than on the first. With break-back traps, on the other hand, the number typically falls on the second occasion. If the animals caught in live traps are marked and released, they form a larger proportion of subsequent catches than can be entirely accounted for by chance, or by a possibly greater activity on their part. This finding suggests that avoidance of "new objects" may be a character of the behaviour of many rodents.

In the light of this a new live trap has been designed. It has been found that a double-ended "through vision" trap has no great advantages over a single-ended one. One end of the tunnel of the new trap is closed by a nest box, which also helps to keep the trapped animal in better condition. The trap is named the "Longworth" trap and the following advantages are claimed for it: semi-automatic setting not dependent on the skill of the setter, adjustable sensitivity to weights of 1·5 to 8·0 gm., stability when set, ease of cleaning and its lightness—the tunnel weighs 3·3 oz., the nest box 3·95 oz. and 55 complete traps weigh 25 lb. *J. H. Sudd*

MEYER, K. F. **Modern Therapy of Plague.** *J. Amer. Med. Ass.* 1950, Nov. 18, v. 144, No. 12, 982–5. [28 refs.]

On the basis of laboratory experiments and experiences in the field the author recommends that cases of plague should be treated with streptomycin in daily doses of 4·0 gm. at first, with reduction of the dose on the 3rd or 4th day of recovery. After the 5th day the drug may be replaced by sulphadiazine or sulphamerazine in daily doses of 4·0 gm.

In severe septicaemic and pneumonic cases aureomycin, chloramphenicol or terramycin in doses of 2·0 to 4·0 gm. should be given in addition to streptomycin, and immune rabbit serum globulin should also be given if available.

Patients who do not respond within two or three days to streptomycin and sulphonamides in the above doses may benefit from aureomycin or one of the other newer antibiotics.

When the antibiotics are not available, sulphadiazine or sulphamerazine should be given in initial doses of 4·0 gm., followed by 1·0 gm. every four hours for not more than 10 days.

Persons exposed to risk of infection through contact with cases of primary pneumonic plague should be given 2·0 to 3·0 gm. of sulphadiazine or sulphamerazine daily for five days, and if, in spite of this treatment, symptoms should occur, intensive treatment with the antibiotics should be given.

John W. D. Megaw

SOULAGE, J., FARINAUD, M. E., TAUZIN, M. & LEFEBVRE, E. Peste et streptomycine. Essais de traitement réalisés en Indochine. [**Streptomycin in the Treatment of Plague in Indo-China.**] *Méd. Trop.* Marseilles. 1950, May–June, v. 10, No. 3, 537–48, 14 charts.

The authors describe 14 consecutive cases of plague treated successfully with streptomycin given intramuscularly in doses of 0·5 gm. every three or four hours till the temperature became normal, and then in smaller doses amounting to 1·0 gm. daily till a total quantity of 15 gm. had been given. In most of the cases sulphonamides were given after the course of streptomycin; the most effective of these was sulphamethyldiazine, next came sulphadiazine and the least effective of the three that were tried was sulphathiazole.

John W. D. Megaw

QUAN, S. F., CHEN, T. H. & MEYER, K. F. **Protective Action of Antibiotics against the Toxin of** *Pasteurella pestis* **in Mice.** *Proc. Soc. Exper. Biol. & Med.* 1950, Nov., v. 75, No. 2, 548–9.

"Intraperitoneal administration of aureomycin, chloramphenicol and terramycin in 2·0 mg doses within 12 hours of intravenous injection of plague toxin conferred definite, but limited, antitoxic protection to mice. Streptomycin was without this protective action. Aureomycin injected 1 hour or 12 hours prior to toxin exerted the greatest protective effect. Chloramphenicol was not as effective as either aureomycin or terramycin against *Pasteurella pestis* toxin."

CHOLERA

COLLIER, H. O. J. & WATERHOUSE, Pamela D. **Studies in the Chemotherapy of Cholera. IV. Antagonism of the Antibacterial Activities of 2 : 4-Diaminopteridines, Sulphaguanidine, and their Mixtures.** *Ann. Trop. Med. & Parasit.* 1950, Oct., v. 44, No. 3, 273–80. [17 refs.]

The fourth paper of this series [see this *Bulletin*, 1950, v. 47, 236 ; 1196] on the antibacterial action of certain 2 : 4 diaminopteridines deals with the antagonism shown to their action by pteroylglutamic acid, pteroic acid, *p*-aminobenzoic acid and peptone. Experiments were carried out with *V. cholerae* and *Streptococcus faecalis*, the latter being an organism which is unable to synthesize the pteridine fraction of pteroylglutamic acid.

Streptococcus faecalis. The pteridines 0/129 and 0/120/II actively inhibited the growth of this organism and their action was not actively antagonized by pteroylglutamic acid. The pteridine 0/69 was less active and its action was more readily overcome.

Aminopterin and 2 : 4-diamino-6 : 7-diphenylpteridine were also less active and more markedly antagonized by the concentrations of pteroylglutamic acid used. When the concentration of pteroylglutamic acid was increased, more of each pteridine was required to inhibit growth. Pteroic acid at ten times the concentration of pteroylglutamic acid employed showed some antagonism to the action of 0/129 and 0/120/II.

V. cholerae. Antagonism to the inhibiting action of the pteridines, sulphaguanidine, and mixtures of the two on the growth of the vibrio was tested, the substances used being pteroylglutamic acid, pteroic acid, *p*-aminobenzoic acid and peptone. The inhibiting action of 0/129 and 0/120/II was only slightly reduced by relatively high concentration of pteroylglutamic acid and of pteroic acid. The action of sulphaguanidine was reduced by pteroylglutamic acid. The vibriostatic action of 0/129 and 0/120/II was not antagonized by *p*-aminobenzoic acid which antagonizes sulphaguanidine.

Peptone slightly antagonized the action of 0/129 on the vibrio but not that of 0/120/II. It strongly antagonized sulphaguanidine.

Pteroylglutamic acid, *p*-aminobenzoic acid, and peptone somewhat reduced the vibriostatic action of the mixtures of 0/129 and 0/120/II with sulphaguanidine. *J. Taylor*

GALLUT, J. Relations antigéniques entre vibrion cholérique et brucelles. [**Antigenic Relationships between Cholera Vibrios and *Brucella* Organisms.**] *Ann. Inst. Pasteur.* 1950, Sept., v. 79, No. 3, 335–8.

In relation to the observation reported by several workers that the sera of persons inoculated with cholera vaccine sometimes agglutinate strains of *Brucella* to significant titre, the author reports his finding that the cholera vibrio and organisms of the *Brucella* group possess a common O antigen.

The sera in routine use at the Pasteur Institute for diagnosing *V. cholerae* were employed for agglutination tests against three strains of *Brucella*. These were *Br. melitensis* (I.P.), *Br. melitensis* (P900) and *Br. suis*. The results varied with the antigenic type of *V. cholerae* used in preparing the sera. None of the *Brucella* strains was agglutinated by serum prepared against an Ogawa strain of *V. cholerae*, which contains O agglutinins for the factors A and B.

[The author uses the nomenclature for the O factors of the vibrios which he employed in a previous paper—see this *Bulletin*, 1949, v. 46, 631.]

A serum containing O agglutinins for the factors A, C and D, at a homologous titre of 1 in 2,000, agglutinated *Br. melitensis* (I.P.) at a dilution of 1 in 500, and both *Br. melitensis* (P.900) and *Br. suis* at 1 in 2,000. With absorbed sera containing pure form agglutinins of the A, B, C and D factors respectively, the two *melitensis* strains were agglutinated only by D serum and the *Br. suis* strain by both C and D sera. The conclusion is that common factors responsible for co-agglutination are the C and D fractions of *V. cholerae*. The A factor common to all cholera vibrios is not concerned. Anti-*Brucella* sera, however, gave only one-twentieth of the titre against *V. cholerae* that they showed against their homologous strains.

Cross-absorption tests with *Br. suis* and *V. cholerae* sera, and precipitin tests, confirmed the finding on the factor responsible for co-agglutination. As the C factor is present in the Inaba form of *V. cholerae*, which is always included in cholera vaccine, and according to the author, factor D frequently accompanies it, it will be expected that persons inoculated may show evidence of some anti-*Brucella* agglutinins. This may also be found in persons recovering from cholera. *J. Taylor*

CHAUDHURI, R. N., GHOSAL, S. & RAI CHAUDHURI, M. N. **Chloromycetin in the Treatment of Cholera.** *Indian Med. Gaz.* 1950, Sept., v. 85, No. 9, 398–400.

Ten patients with typical attacks of cholera who were admitted to hospital in Calcutta in the stage of evacuation or collapse, 5 to 14 hours after the onset of the attack, were treated with chloromycetin ; an equal number of alternate cases admitted at the same time were taken as controls. All received the usual saline transfusion treatment, but no previous treatment had been given. No clinical difference was observed between the two groups ; there were two deaths in the treated and one in the control group. Culture of the stools of those receiving chloromycetin showed a marked reduction in the number of colonies of *V. cholerae* after 24 hours' treatment, and at 48 hours cultures were negative. In contrast, the vibrio could be isolated from the stools of the control patients up to the seventh day.

The authors express the opinion that "no drug is likely to influence the disease when severe dehydration is present with all its complications". It is suggested that perhaps if it is given at the earliest stage, before dehydration develops, chloromycetin might be of some value.

Trials of the possible prophylactic value of chloromycetin are suggested in view of its quick action on the vibrios. *J. Taylor*

i. SOKHEY, S. S., HABBU, M. K. & BHARUCHA, K. H. **Hydrolysate of Casein for the preparation of Plague and Cholera Vaccines.** *Bull. World Health Organization.* Geneva. 1950, v. 3, No. 1, 25–31. [11 refs.]

ii. —— & ——. **Casein Hydrolysate Cholera Vaccine.** *Ibid.* 33–42, 1 fig. [10 refs.]

iii. —— & ——. **Biological Assay of Cholera Vaccine.** *Ibid.* 43–53.

iv. —— & ——. **Antigenic Structure of the Cholera Vibrio and Protective Power of the Vaccine.** *Ibid.* 55–61.

i. A description is given of the method employed in preparing a modification of MUELLER and JOHNSON's acid hydrolysate medium [*Bulletin of Hygiene*, 1941, v. 16, 291] for use in the manufacture of plague and cholera vaccines in liquid culture form. The digest, as ordinarily prepared, was of an orange-brown colour and gave a growth of 400 million *P. pestis* per ml. after 48 hours' incubation at 28°C. When the medium was decolorized to a pale lemon-yellow colour by the addition of charcoal, the yield was increased to 700–1,000 million per ml. The best results were obtained by two treatments with 0·5 per cent. Nuchar charcoal at two stages—once when the medium was acid and again when it was neutral or only slightly acid. The addition of Tween 80 at a concentration of 0·01 per cent. further improved the growth of *P. pestis* and produced a uniform suspension without clumps. A product of remarkable constancy, in successive batches, was obtained as judged by bacterial counts. The finished medium had a total nitrogen control of 2·7 mgm. per ml. of which 1·8 mgm. was amino nitrogen.

A modified form of the medium was also used for the preparation of cholera vaccine in liquid culture. Tween 80 was omitted as it was found to reduce the growth of *V. cholerae*. The decolorized hydrolysate was diluted with 0·5 NaCl solution to lower the nitrogen content to 135 mgm. per 100 ml. as this level was found adequate. Three-litre Haffkine flasks were used for cultures, 1,000 ml. being the volume of the medium used in the case of plague vaccine and 500 ml. in the case of cholera.

ii. A cholera vaccine prepared by growth in a liquid medium at the Haffkine Institute, Bombay, has been issued on a large scale during the last five years in substitution of the usual type prepared in the form of suspensions from agar culture. A description of the medium employed is given in the preceding paper. Culture is carried out in 500 ml. quantities of the casein hydrolysate medium, incubation being at 37°C. for three days. Ogawa and Inaba fractions are prepared separately from selected strains maintained in freeze-dried form. The growth is killed by the addition of 4 ml. of formalin 1/10 to each culture flask, giving a concentration of 0·08 per cent. The flasks are then incubated for a further period of three days and, after a sterility test, 15 ml. of a solution of phenyl mercuric nitrate containing 50 mgm. per 100 ml. are added for preservation.

The Owaga and Inaba fractions are pooled in equal quantities before they are put in ampoules. This is considered necessary by the authors who have found that there is little cross-protection between the two forms.

The strains used for vaccine manufacture are those which are found to be highly virulent, as judged by their lethal dose for the mouse. The protective power of vaccines made from virulent strains of *V. cholerae* was found to be 5 to 120 times that of some other vaccines with which they were compared, and which had been made with strains not fully virulent for the mouse. The basis of comparison was the relative protective dose of the vaccines. It was concluded that protective power is linked with virulence.

The vibrio content of vaccines issued is not stated on the label as it is considered that bacterial count is not an indication of protective value. The mouse protection test is the criterion taken, and as it has been the experience that the protective value of different batches varies little when the method of manufacture is rigidly standardized, it is thought sufficient to carry out protection tests on only one batch in the month.

The authors find the vaccine prepared in the casein hydrolysate medium in the manner described, to show higher protective power than agar-grown vaccines generally used in India, even when the latter are prepared from the same virulent strains, and also to be more effective than the vaccine described as B.R.F. [Biochemical Research Foundation] direct cholera vaccine.

iii. A method of biological assay of the protective value of cholera vaccine has been developed, and is in routine use, in the Haffkine Institute, Bombay.

Groups of mice are given graded doses of the vaccine under test and are then submitted to challenge with a standard dose of a virulent strain of *V. cholerae*. The mean dose of vaccine giving 50 per cent. protection is taken as the measure of potency.

The strain for challenge selected is one of which 1,000 vibrios contained in 0·5 ml. of 5 per cent. mucin will kill not less than five out of ten mice of the Swiss strain or other equally susceptible strain, about 5 weeks old and weighing 18–21 grammes. The standard dose test is 100 times the minimum lethal dose of the strain selected as above.

Batches of six mice, each about three weeks old and weighing 10–12 gm. are used, and the selected doses of the vaccine, designed to give a 50 per cent. mortality in the middle of the series, are given subcutaneously in two equal parts at an interval of seven days. The challenge dose is given seven days after the second dose when the mice will weigh 18–21 gm. Controls of that weight are also used. The 50 per cent. mortality level is then calculated by the method of Reed and Muench (*Amer. J. Hyg.*, 1938, v. 27, 493). The type of result obtained is illustrated by a finding of a mean value of 0·000037 ml. for the 50 per cent. mouse protective dose with a standard deviation of 0·00001 ml. This method of test was compared with the procedure of keeping the immunizing dose of the vaccine constant and varying the challenging dose, which had been tried at the National Health Institute, Bethesda, Md. It was concluded that the results with the constant challenging dose of *V. cholerae* are more accurate and consistent.

Reference is made to the method of test described by Ranta and Dolman (*Canadian J. Pub. Health*, 1944, v. 35, 473) which only aims at assuring a certain minimal immunizing capacity for mice, in vaccines released for human use. In the test very large doses of vaccine are given as compared with those employed at the Haffkine Institute and on that account the opinion is expressed that the test does not fulfil even that limited aim.

There has been no opportunity in India so far to carry out field trials of cholera vaccine prepared in the manner described in this series of papers and tested by the method now employed at the Haffkine Institute.

iv. Following on the work of Burrows *et al.* and also of Gallut [see this *Bulletin*, 1949, v. 46, 631] who have reported finding 13 different O antigenic factors (ABC . . . M) in an analysis of a series of strains of *V. cholerae*, present in different proportions and admixtures, the authors undertook an investigation on the influence of these multiple fractions on the protective power of cholera vaccine.

The tests were carried out with strains exchanged between the Pasteur Institute, Paris, and the Haffkine Institute, Bombay, of which Dr. Gallut determined the antigenic structure on the lines of his previous work.

The Haffkine Institute strains were an Ogawa form to which the O antigenic structure assigned was ABE, and an Inaba form with the factors A, C, D, the E and D factors being additional to the AB and AC antigens ordinarily accepted as characteristic of the two types. The Pasteur Institute strains included two from the National Health Institute, Bethesda, (ACDE and ABE), and four others with additional factors up to 10 in number.

Vaccines were prepared from all eight strains and tested in accordance with the methods given in the preceding papers. Challenge was by both Ogawa and Inaba strains.

A high degree of protection was given by vaccine prepared from the Haffkine Institute and the N.I.H. strains which were highly virulent for the mouse. No protection was given even by very high dosage of vaccines prepared from three of the Pasteur Institute strains which were found to be avirulent, and only a moderate degree of protection was given by a vaccine made from the fourth strain which was of low virulence. It is concluded that the protective power of the vaccine is not determined by complexity of antigenic structure but is related to the virulence of the strain used in manufacture.

The questions are raised whether the avirulent strains which yield vaccine of little or no protective power may not have degenerated in the conditions in which they have been maintained, and whether degeneration may explain their complexity of antigenic structure. *J. Taylor*

FELSENFELD, O., YOUNG, Viola M. & ISHIHARA, Sachiko J. **Experiments with Antibiotic-Killed Cholera Vaccines.** *Amer. J. Trop. Med.* 1950, Nov., v. 30, No. 6, 863–4.

" Cholera vaccines containing organisms killed with streptomycin, aureomycin and neomycin were tested and found effective in small groups of mice. Neomycin-killed vaccine in large-scale experiments in mice was at least as effective as the routinely used formolized and phenolized vaccines."

i. BURROWS, W., DEUPREE, Norma G. & MOORE, Dorothy E. **The Effect of X-Irradiation on Experimental Enteric Cholera in the Guinea Pig.** *J. Infect. Dis.* 1950, Sept.–Oct., v. 87, No. 2, 158–68, 4 figs. [10 refs.]

ii. ——, —— & ——. **The Effect of X-Irradiation on Fecal and Urinary Antibody Response.** *Ibid.* 169–83, 12 figs. [12 refs.]

i. In continuation of previous work on serum- and copro-antibody in guinea-pigs immunized with cholera vaccine [see this *Bulletin*, 1948, v. 45, 898] and on the effect of X-irradiation on copro-antibody response, the results are now reported of investigations on the effect of irradiation on experimental cholera infection which ordinarily produces a symptomless and non-fatal condition in guineapigs.

A suspension of a culture of *V. cholerae* was instilled intragastrically in guineapigs after administration of morphine sulphate, and the subsequent development of the infection and the antibody response, after irradiation, was observed. Preliminary examinations in animals submitted to irradiation but not infected with *V. cholerae* showed that in a proportion a bacteraemia developed, presumably by invasion of the blood stream by organisms present in the bowel, staphylococci and haemolytic streptococci being isolated from the heart blood and some of the organs. In the case of animals infected with the cholera vibrio and also irradiated, positive cultures were obtained from the heart blood and organs in 63 per cent. In 44 per cent. of the positives the organism present was *V. cholerae* and from the remainder staphylococci and

streptococci were isolated. A similar general tissue invasion did not occur in non-irradiated animals. It is considered that this finding is "consistent with the belief that a bacteremia of intestinal origin is part of radiation sickness".

When a dose of 150 to 200r was given the intensity of infection, as measured by the number of vibrios excreted, was reduced in the first three days and a rise in copro-antibody occurred. Later the antibody titre declined during the period of tissue invasion. At a lower dosage of 100r, copro-antibody was not effectively inhibited and the intensity of infection was reduced, an over-all therapeutic effect being obtained.

The inverse relationship noted between the copro-antibody titre and the severity of the infection would support the hypothesis that copro-antibody may play an effective part in immunity to enteric infection. The possibility is suggested that a factor concerned in bacterial invasion of the tissue after irradiation may be the inhibition of copro-antibody for the organisms of the normal intestinal flora.

ii. The effect of X-irradiation on immunity response in guineapigs was investigated when inoculation with cholera vaccine was carried out either before or after exposure. Serum, faecal and urinary antibody levels were determined at different periods in relation to irradiation.

Pre-immunization exposure to 50 to 200r produced a sharply reduced serum agglutinin titre ; a transitory rise occurred in faecal and urinary antibodies when immunization was begun one day after irradiation but not if it was begun after three days. Serum agglutinin titre was not appreciably affected by post-immunization irradiation, but doses of 100 to 150r inhibited excretion of faecal and urinary antibody.

Excretion could be restored in some degree by "booster" doses of the vaccine.

The effect of X-irradiation appears to depend on the dosage given and the stage at which the exposure is carried out in relation to the administration of the vaccine. It is considered that the results noted under different conditions of exposure may explain the contradictory findings of other workers on the beneficial or detrimental effect of irradiation. *J. Taylor*

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

Rees, C. W., Reardon, Lucy V. & Bartgis, Ida L., with the collaboration of L. Hellerman. **The Excystation of *Entamoeba histolytica* without Bacteria in Microcultures.** *Parasitology*. 1950, Oct., v. 40, Nos. 3/4, 338–42, 1 fig. [21 refs.]

In a previous paper the senior author and his collaborators [this *Bulletin*, 1948, v. 45, 79] have shown that *Entamoeba histolytica* is capable of hatching in cultures in the absence of bacteria, when complex organic substances are added to the medium. However, the effect of specific organic compounds remained unknown. The present paper records studies of the effect of fluid media containing measured amounts of inorganic compounds as compared with the same fluids after addition of specified organic compounds.

The media used were based on the formulae developed by Anfinsen *et al.* [this *Bulletin*, 1947, v. 44, 1043] for the cultivation of malaria parasites. They comprised the following variants : (*a*) an inorganic fluid containing carbon dioxide and chlorides, phosphates and bicarbonates of sodium, potassium, magnesium and calcium ; (*b*) an inorganic fluid with chlorides and phosphates of the same elements but without bicarbonates ; (*c*) the same fluids with

addition of glucose and (*d*) the same enriched with B vitamins, cocarboxylase, vitamin C, purines, pyrimidines, folic acid, glucosamine, cholesterol, and amino-acids. In all the media the oxygen content was lowered, with the use of cystein or glutathione.

These media were used for tests with a strain of *E. histolytica* (NRS) which was induced to encyst, after which the suspension containing cysts was treated with HCl to destroy trophozoites and some of the accompanying bacteria, and finally bacteria-free cysts were transferred by micro-isolation to micro-tubes (made of capillary glass tubing) containing the different media in solution. The tubes were sealed in a flame and kept at 37°C. for 8–10 hours, when they were examined microscopically for the presence of excysted amoebae.

The results of the experiments are given in tabular and graphical forms. They show that the percentage of excystation was very low in the inorganic media without bicarbonates, moderate in inorganic fluid with bicarbonates and glucose, and highest in media with bicarbonates and all the organic compounds used, while the presence of amino-acids was not essential. From these data it is evident that excystation is promoted by the presence of organic compounds in the medium. Moreover, the technique of examining the results microscopically in microtubes affords a ready method for evaluating the comparative effect of various culture media and of their separate ingredients.

C. A. Hoare

SPINGARN, C. L. & EDELMAN, M. H. **The Effect of Rice Powder on the Growth of Cultures of** *Endamoeba histolytica*. *Amer. J. Trop. Med.* 1950, Sept., v. 30, No. 5, 629–34. [20 refs.]

The improvement in the cultivation of *Entamoeba histolytica* resulting from the addition to the medium of rice starch is well known. In the present paper the authors report quantitative observations on the effect of rice flour on the growth of this amoeba *in vitro*.

Three strains of *E. histolytica*, accompanied by different bacteria, were grown in a medium consisting of agar slants, prepared from 7 cc. of Difco "*Endamoeba* medium" covered with 2·9 cc. of a 1 : 6 mixture of horse serum and saline. To this medium was added sterilized "Bacto-Rice Powder" (Difco) in amounts from 25 to 400 mgm. The exact chemical composition of this powder is not known, but it is thought to contain 77·2 per cent. carbohydrate, 8·9 per cent. protein and 2·0 per cent. fat, with small amounts of vitamins and mineral salts.

The effect upon the amoebae of the amount of rice starch added to the medium was determined by (*a*) the maximum number of amoebae found in daily counts with a haemocytometer, (*b*) the number of days required to reach the highest point, (*c*) the fold increase in the amoebic population, and (*d*) the period of survival of the population.

In general, the addition of rice starch resulted in increased growth and length of survival of the cultures. The duration of the life of the culture was directly related to the rice starch content of the medium. However, the highest numbers of amoebae were obtained 3–4 days after inoculation in cultures with 50 mgm. of rice powder, which was therefore the optimum amount. Larger amounts not only failed to produce an increase of the population but were actually less favourable to the growth of the amoebae than small amounts of starch. It is thought that the inhibitory effects on amoebic growth of excessive amounts of rice might be due partly to the fall of *p*H in the overlay of the medium. The addition of rice powder had no apparent effect on the concomitant bacterial flora of the cultures.

It is noted that the influence of the amount of rice in the medium upon the degree and duration of amoebic growth should be taken into consideration when the effect of drugs on *E. histolytica* is being assessed, since the amoebicidal action may result in poor growth of the surviving amoebae owing to the relative excess of rice powder rather than to direct decrease of the population.

C. A. Hoare

SADUN, E. H., ANÉ, J. N., FULLER, Frances W. & LEWIS, Ruth. **The Effect of X-Ray upon the Growth and Infectivity of** *Endamoeba histolytica*. *Amer. J. Trop. Med.* 1950, Sept., v. 30, No. 5, 635–40.

The investigation described in this paper was carried out with the view to determine the effect of exposure of *Entamoeba histolytica* to X-rays on its cultivation, growth and infectivity. For this purpose cultures of two strains of amoebae were used: one grown in Shaffer-Frye (S-F) fluid medium with a single species of bacteria ("streptobacillus"), the growth of which was partly suppressed; the other in Balamuth's egg-yolk infusion (B). For irradiation amoebic cultures were concentrated by centrifuging, and 6 ml. amounts of the suspension were placed in 16×50 mm. plastic tubes with airtight covers. These tubes were exposed to X-rays under 250 kilovolts, 15 milliampères, at a distance of 12·6 cm. from the centre of the tube, the intensity of irradiation being 2,119 roentgens per minute.

The results were determined by examination and haemocytometer counts of amoebae after exposure of cultures, and by intracaecal inoculation of such cultures into guineapigs. Some of the tubes contained minute amounts of neutral red, which increases the radiosensitiveness of some amoebae. It was found that single irradiations up to 120,000 roentgens did not kill all the amoebae in either of the media used for cultures, nor did a similar exposure of the accompanying streptobacillus affect the growth of untreated amoebae. While exposure of B cultures up to 30,000r did not affect the normal population growth of the amoebae, it was slightly inhibited by exposures to 60,000 and 120,000r. It could not be ascertained whether this action was due to these doses being lethal to the majority of the amoebae, or to a slowing down of their reproduction. There was no difference in the reaction to X-rays between cultures containing neutral red and controls. After irradiation with 120,000r, the amoebae remained viable in 16 serial subcultures. When the descendents of amoebae irradiated with such a dose were inoculated into guineapigs they produced in them infections with intestinal lesions indistinguishable from those produced in these animals by control cultures.

C. A. Hoare

CRAIG, C. F. **Amebiasis and the Complement-Fixation Test.** *U.S. Armed Forces Med. J.* 1950, Nov., v. 1, No. 11, 1337–42.

Some fifty years ago, when the author first became interested in the condition, the term "amoebic dysentery" was applied to all forms of infection with *Entamoeba histolytica*; "amoebiasis" is much preferable as it includes all infections with the parasite, whether it produces symptoms or not. Even to-day it is not generally appreciated that dysentery is only one of the symptoms for which the parasite may be responsible.

The variations in the severity of the lesions due to *E. histolytica*, and the response of the tissues to them, account for the apparent contradictions in the results of the complement-deviation test for amoebiasis. Sera from patients with few or no symptoms of an infection may give a four-plus reaction; sera from some patients with severe symptoms may give a weak or negative reaction. It has repeatedly been shown that the symptomatology in cases of amoebiasis

is not necessarily proportional to the degree of tissue invasion. There may be gross amoebic lesions in patients with no symptoms ; the complement-deviation test in such cases would probably be positive, as it frequently is in " latent " infections. In some cases with very severe dysentery the reaction may be negative, as the body cannot then produce complement-fixing bodies. There is no lasting immunity in amoebiasis ; the complement-deviation test becomes negative 2 to 4 weeks after eradication of the infection ; a persistent positive reaction after this period indicates a persisting infection even if the parasites have vanished from the stools ; this infection possibly may be in the liver, and if so an amoebic liver abscess will follow in due course.

Essentially a diagnosis of amoebiasis rests on the recovery of the parasite by stool examinations, by sigmoidoscopic examinations, or by culture of the stools. The complement-fixation test at present affords only help in diagnosis, and is to be performed after a search has been made for parasites ; like other complement-fixation tests it is not infallible, there may be false positive or false negative results. Antigens for the test can be made from cultures of the parasite or from cysts ; those antigens used at present are prepared from parasites contaminated with bacteria. That this bacterial contamination is not the cause of false positive reactions and that the reaction in amoebiasis is a specific one are proved by the facts that a positive reaction changes to a negative one when the amoebic infection has been eliminated, that a positive reaction is obtained with an antigen prepared from washed cysts, and that positive reactions are given by the sera of animals immunized against amoebae from which the bacterial antibodies have been removed. With the author's technique, sera from cases of symptomatic amoebiasis give positive reactions in 85 to 90 per cent. of cases ; and 70 to 80 per cent. of sera from asymptomatic cases give positive readings. The results of other workers have varied, probably because of variations in technique and of the strength of the antigen used ; unnecessary refinement of technique has militated against the diagnostic value of the test. A strongly positive test justifies a presumptive diagnosis of an *E. histolytica* infection ; a negative one does not prove its absence.

The complement-fixation test is of value in (*a*) the disclosure of carriers, (*b*) the diagnosis of liver abscess, (*c*) the diagnosis of actual amoebic dysentery, (*d*) determining the effect of treatment, and (*e*) the assessment of the action of speculative drugs in animals ; but it never obviates the need for search for the parasite. The complement-fixation test may be expected to become increasingly of value in diagnosis as better antigens and technical methods are introduced. *A. R. D. Adams*

DI PIETRO, P. Considerazioni su un caso di papilloma della vescica associato ad amebiasi vescicale ed intestinale. [**A Case of Papilloma of the Bladder associated with Vesical and Intestinal Amoebiasis.**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1950, Aug., v. 31, No. 8, 601–5.

The patient, a man of unstated age, in Assab, East Africa, in 1938 felt a sudden pain in the right lumbar region, diagnosed as renal colic ; this recurred four or five times at intervals. In 1940 he had an attack of fever, was given anti-malarial treatment and recovered. During the next two years he was subject to pain in the appendix region. In 1942 he was at Eldoret as a prisoner of war, and after " some physical effort " he passed coffee-coloured urine ; at intervals of a few months he had three or four similar attacks, with burning pain, not severe, along the urethra. In 1943, when he was in hospital, examination of his urine revealed cysts of *E. histolytica*. Although there were no intestinal symptoms the faeces were examined and similar cysts were seen. A course of emetine was given, followed by one of trovarsol [not defined, ? stovarsol]

3 tablets of 25 cgm. each, for 7 days, and parasites were no longer seen in urine or faeces. In October, 1943, in a British hospital cystoscopic examination disclosed a papilloma, 8–10 mm. in diameter, near the trigone. He was transferred to the Nairobi Hospital where a urologist confirmed the finding, but did nothing, hoping that it would disappear spontaneously. Unfortunately it did not ; haematuria increased and the growth was found to measure about 20 mm. across. Parasites were not seen in the urinary deposit but the faeces contained vegetative and cystic forms of *E. histolytica*. Early in February 1944 the bladder was opened and the main tumour and several small satellite tumours were treated by thermocautery. Recovery was uneventful. It would have been interesting, adds the author, to examine the papilloma histologically to determine whether it had been " implanted on an inflammatory new formation provoked by the parasite ". All will agree with this. *H. Harold Scott*

KLEEBERG, J. & BIRNBAUM, D. **Observations on the Effect of Aureomycin in Human Amoebiasis.** *Harefuah.* Jerusalem. 1950, Nov. 15, v. 39, No. 10. [In Hebrew 120–21. English summary 121.]

The authors, in Israel, treated 20 patients suffering from amoebiasis with aureomycin in total doses of 7–15 gm. in 7 to 10 days. There were no toxic side-effects of note, other than slight nausea in most patients and mild signs of vitamin B complex deficiency occasionally : the administration of vitamin B after aureomycin therapy is recommended.

Trophozoites and cysts of *E. histolytica* disappeared after 3–6 gm., usually in 3 to 4 days, and clinical improvement was obvious.

Two of four cases of acute amoebic dysentery relapsed after 3 weeks and 3 months respectively, but one of them became free from symptoms for 4 months when twice the original dose was given. One patient had a parasitological relapse 7 days after a schedule of 7 gm.

The usual procedure is now to give 2 gm., daily for at least 7 days.

One patient had amoebic hepatitis : he remained free of complaints for 3 months. Eight patients also harboured *Trichomonas hominis*. They showed an increase of these flagellates for 7 to 10 days. No such reaction occurred with *Giardia* or *Chilomastix*.

The authors consider that the effect of aureomycin on protozoa may be due to (1) a change in intestinal flora, (2) direct amoebicidal affect, (3) direct stimulation of growth of *Trichomonas*.

Aureomycin treatment requires no strict diet nor bedrest. Patients should be re-examined after 1, 3, 6 and 12 months. *H. J. O'D. Burke-Gaffney*

AUFFRET, C. & TANGUY, F. Répartition et durée de fixation de la conessine dans les organes du singe. [**Distribution and Persistence of Conessine in the Tissues of Monkeys.**] *Méd. Trop.* Marseilles. 1950, May–June, v. 10, No. 3, 530–36.

Conessine, an alkaloid from *Holarrhena* species, is widely used in France for the treatment of intestinal amoebiasis. Frequently administration is accompanied by nervous symptoms and the authors have therefore determined the distribution of the drug in organs and tissues of monkeys to find out if some explanation of these nervous manifestations was forthcoming. Five animals were given 5 mgm. of the hydrochloride per kgm. per day for seven days and were killed at intervals after the end of treatment. The tissue was

first homogenized and extracted with N.HCl and protein removed with trichloracetic acid, as it tends to give rise to troublesome emulsions. After the extract was made alkaline the base was extracted with petroleum ether from an aliquot containing not more than 30 μgm. of the alkaloid. The coloured complex, soluble in chloroform, which the base forms with eosin, was used for estimation in an electrophotometer as described by PLUCHON and PILLE [this *Bulletin*, 1950, v. 47, 468] when estimating conessine in urine, bile and faeces. The results were then expressed as mgm. of the drug per 100 gm. of organ or tissue, and it appears to be widely distributed throughout the body. Unlike emetine, which was found by PARMER and COTTRILL [this *Bulletin*, 1949, v. 46, 1035] to be absent in brain tissue, conessine was found to be present, but in relatively small amounts. The highest levels were found in liver, spleen, lung and kidney, but conessine was generally not detected in the blood; however, in a sixth animal treated with double the dose of those above and killed 24 hours after treatment ended, the alkaloid was present to the extent of 0·03 mgm. per 100 ml. blood. Elimination is very slow and after 42 days conessine was still present in lung tissue. *J. D. Fulton*

NEAL, R. A. **An Experimental Study of *Entamoeba muris* (Grassi, 1879); its Morphology, Affinities and Host-Parasite Relationship.** *Parasitology*. 1950, Oct., v. 40, Nos. 3/4, 343–65, 23 figs. [80 refs.]

Rats are now employed extensively as experimental hosts of *Entamoeba histolytica* in the screening of new chemical compounds for amoebicidal activity. One of the drawbacks in the use of these animals is the fact that both wild and white rats are commonly infected with an amoeba of their own (*E. muris*), the presence of which introduces a complicating factor in the experiments. On this account it is important to differentiate natural infections with *E. muris* from experimental infections with *E. histolytica*. In view of the discrepant accounts regarding the structure, bionomics and systematic position of *E. muris*, the author has undertaken a revision of this parasite. In this paper he gives a detailed description of the morphology and development of the amoebae from rats and mice, from which he concludes that they are represented by one species, *E. muris*.

He then describes cross-infection experiments of rats, mice and hamsters with their respective amoebae, which were found to be interchangeable. This fact accounts for the high incidence of infection with *E. muris* in laboratories, where various rodents are kept together. In connexion with the above experiments, the author also deals with the precautions which were successfully taken to prevent infection among the experimental animals under laboratory conditions.

Since *E. muris* is indistinguishable from *E. coli*, both in the active and encysted stages, experiments were carried out to determine the degree of host-restriction of the human parasite, with the use of rats, which are more likely to be contaminated with *E. coli* than mice. These animals were fed with cysts of *E. coli* from human faeces and from cultures but the results were invariably negative. The entamoeba of rats and man thus differ in physiological characters. Though identical, they are retained as distinct species, until the metacystic development of *E. muris* is fully studied.

The author also discusses the incidence of *muris*-like entamoebae among other rodents, a list of which is provided. This paper should help to solve some of the difficulties in experimental amoebiasis of rodents which have baffled previous workers. *C. A. Hoare*

SCHNEIDER, J. & MONTÉZIN, G. Amibiase expérimentale du rat. Résultats de premiers essais thérapeutiques. (3e note.) [**Therapeutic Tests in Experimental Amoebiasis of the Rat.**] *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 7/8, 413–15.

Before embarking on a programme of screening tests of new chemical compounds, using the rat as an experimental animal, the authors tried out the effect upon rats infected with *Entamoeba histolytica* of known amoebicidal drugs.

All the drugs, except emetine, were administered orally in the course of four days starting from the 2nd day after intracaecal inoculation of the amoebae. On the 8th day the rats were sacrificed and the caecal contents were examined for the presence of parasites.

Emetine was found to be effective in a dose of 5 mgm./kgm.; stovarsol in 1 gm./kgm., but this is very near the toxic dose; while the same dose of yatren proved to be insufficient. The effective dose of conessine was between 100 and 200 mgm./kgm., while that of aureomycin was slightly higher than 400 mgm./kgm. *C. A. Hoare*

KLEEBERG, F. & BIRNBAUM, D. **Effect of Aureomycin on** *Trichomonas intestinalis hominis.* [Correspondence.] *Nature.* 1950, Dec. 9, 989.

In this note the authors discuss the observation made above that an increase in the numbers of *Trichomonas hominis* had followed the treatment with aureomycin of 8 patients with amoebiasis. Studies are continuing on the effect of aureomycin on the intestinal flora, including the influence of the antibiotic *in vitro* on *Trichomonas hominis.* *H. J. O'D. Burke-Gaffney*

LAMY, L. & ROUX, H. Remarques morphologiques, biologiques et spécifiques sur les *Balantidium* de culture. [**Morphology, Biology and Specific Status of** *Balantidium.*] *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 7/8, 422–7, 1 fig. [22 refs.]

It has long been known that *Balantidium coli* is a parasite common to man and pig, but some observers believed that the pig might be infected with a second species, *B. suis*, which differs from the first-named ciliate mainly in size. The existence of two species of *Balantidium* in the pig was accepted by some and disputed by others, without any convincing arguments being brought forth by either side. Levine, who observed this ciliate in culture, noted the transformation of the *coli*-type into the *suis*-type and *vice versa*, but was unable to determine its cause.

The present authors have studied this problem, using *Balantidium* of porcine origin cultivated at 37°C. in a medium consisting of coagulated horse serum with Ringer's solution+fluid serum (1 : 7), to which rice starch was added. They found that in culture ciliates of the *coli*-type go through a "normal" cycle of reproduction with the formation of propagative cysts, but under certain conditions the smaller forms resulting from division assume the appearance of *suis* and conjugate, the ex-conjugants again reverting to the normal trophozoite of the *coli*-type. It has thus been demonstrated that the so-called "*B. suis*" are actually conjugants of *B. coli*, which is thus the only species of *Balantidium* in man and pig. *C. A. Hoare*

LEPROSY

CHIYUTO, S. **Leprosy—Susceptibility and Transmission.** *J. Philippine Med. Ass.* 1950, Aug., v. 26, No. 8, 363–6. [15 refs.]

TERNI, M. & SIGNORINI, F. L. **An Acid-Fast Microorganism cultivated from Leprous Material. Bacteriological and Serological Observations.** *Internat. J. Leprosy.* New Orleans. 1950, Apr.–June, v. 18, No. 2, 161–7. [11 refs.]

By the use of both the Dubos medium and the larva of the wax moth, an insect which is very receptive to tuberculous infection, the authors report that they have cultivated a slow-growing acid-fast microorganism from a leprous subject. Seventeen persons infected with leprosy were employed in the work with negative results except in one nodular case, from a skin leproma of which a colony grew after three months in a tube of Petragnani's medium ; subcultures grew on the same media and on that of Dubos. Glycerol and protein are necessary for development. Serological reactions suggest that the bacteria are more like *Myco. leprae* than *Myco. tuberculosis*. A fuller report is promised.

L. Rogers

CAMPOS R. de C., J. **Lipoids in the Reactional Tuberculoid Leprosy Granuloma. Their Diagnostic Value.** *Internat. J. Leprosy.* New Orleans. 1950, Apr.–June, v. 18, No. 2, 155–60.

This is a study of presence of lipoids in tuberculoid and lepromatous granulomata, respectively, with a view to their differential diagnosis. The paper should be consulted in the original by those interested ; the following are the conclusions reached. Practically every lepromatous granuloma shows lipoids, usually in medium-sized or large drops. On the contrary, tuberculoid granulomata never have them except in reactional phases, when they appear like a fine dust. This difference is not constant, but is of significance in the diagnosis of the two types. In undifferentiated granulomata, lipoids are met with in half the cases, but their significance in the evolution of cases is not known, nor is mechanism of the formation of lipoids. The lipoid load is only found in those monocytes which do not have the ability to destroy the leprosy bacilli ingested by them ; this lack of ability may be permanent as in the case of lepromatous leprosy, or transitory as in reactional tuberculoid leprosy. *L. Rogers*

ROTBERG, A., BECHELLI, L. M. & KEIL, H. **The Mitsuda Reaction in a Non-leprous Area.** *Internat. J. Leprosy.* New Orleans. 1950, Apr.–June, v. 18, No. 2, 209–20, 3 figs. on pl. [24 refs.]

Intradermal injections of 0·1 cc. of lepromin, together with Mantoux reactions, have been carried out in 190 adults, healthy or tuberculous, who were born in the United States and have never lived in an endemic leprosy area ; the results are compared with similar tests in healthy adults residing in a leprosy endemic area in São Paulo, Brazil.

Late frankly positive lepromin reactions were observed in healthy and tuberculous subjects respectively in 62·4 and 59·7 per cent. ; these percentages approximated the 71·7 per cent. of positive results observed in the São Paulo endemic area, but in this area there was an excess of strong (3+) reactions in comparison with the American healthy group. There was no correlation between the results of the Mitsuda and the Mantoux reactions. The early Fernandez 48-hour reactions in the healthy and tuberculous United States groups were respectively 18·7 and 17·4 per cent., against 55·2 per cent. of the São Paulo group. Cross-sensitization with the tubercle bacillus is therefore accepted

provisionally and the Mantoux-positive-Fernandez-negative condition is probably explainable by the non-obligatory character of cross sensitization. The Mantoux-negative-Fernandez-positive condition is hypothetically explained on the ground that tuberculin was used in high dilutions, whereas the Mitsuda antigens were employed without dilution. *L. Rogers*

FLOCH, H. & DESTOMBES, P. Allergie et para-allergie dans la lèpre. Réaction de Mitsuda ; allergie lépreuse et allergie tuberculoïde ; vaccination par le B.C.G. [**Allergy and Para-Allergy in Leprosy.**] *Internat. J. Leprosy.* New Orleans. 1950, Apr.–June, v. 18, No. 2, 177–83. [16 refs.]

In French Guiana the indigenous Creole population suffers mostly from mild types of leprosy ; the non-indigenous Europeans show severe forms. The Mitsuda reaction is of prognostic but not of diagnostic value ; its study in the absence of leprosy is of interest. In healthy Guiana, in children under 10 years of age, no positive reactions were obtained ; after 10 years of age positive reactions increase steadily in frequency. In countries free from leprosy, positive reactions in adults are a form of para-allergy due to contact with organisms other than the leprosy bacillus, namely other acid-fast ones such as Stéfansky's bacillus of rat leprosy. The only common acid-fast bacillus in non-endemic leprosy countries is the tubercle bacillus. Calmette and others have suggested a cross-immunity between tuberculosis and leprosy, and Mitsuda reactions are usually positive in the same degree as the tuberculin reaction in healthy adults.

The authors have carried out von Pirquet tests in 50 leprosy cases in both healthy and affected zones ; in 14 out of 20 cases allergic to tuberculin, positive reactions were more intense in the affected than in the healthy areas, especially in indifferent or tuberculoid types ; data and tables of these are recorded in this paper. Thus 66 per cent. gave agreement between the two reactions ; in 34 per cent. they differed. Agreement was more frequent in areas free from leprosy ; this indicates the existence of para-allergy between the *Myco. tuberculosis* and *Myco. leprae* in the case of persons infected by the former, but the inverse is far from being the general rule. This is not surprising because *Myco. leprae* is far less pathogenic than is *Myco. tuberculosis.* It is therefore important to transform artificially negative Mitsuda reactions into positive ones both in contacts of leprosy cases and in persons living in endemic leprosy areas ; for the inducement of a positive reaction is likely to result in a certain degree of immunity. BCG vaccination may produce such a result. *L. Rogers*

DE BROEKERT, W. Enkele opmerkingen over de diagnostiek der eerste verschijnselen van lepra. [**Recognition of the Early Manifestations of Leprosy.**] *Nederl. Tijdschr. v. Geneesk.* 1950, Dec. 9, v. 94 (iv), No. 49, 3528–32.

The English summary appended to the paper is as follows :—

" Description of the first clinical symptoms of lepra ; stress is laid on the disturbances in sensitivity and the nerve swellings in tuberculoid forms, as well as on the demonstration of bacilli in the lepromatous forms. Early diagnosis is highly important for present-day therapy."

HEMPEL, G. Über den Wirkungsmechanismus des Chaulmoograöls. [**On the Effect of Chaulmoogra Oil.**] *Ztschr. f. Immunitätsf. u. Exper. Therap.* 1949, Apr. 15, v. 106, No. 2, 154–63. [34 refs.]

The English summary appended to the paper is as follows :—

" The inhibitory effect of chaulmoogra derivatives and 3,5 di-iodine-salicylic sodium on acidfast bacteria (socalled leprosy species) is neutralized or weakened

in vitro by the addition of non-toxic alkaline salts of fatty acids. That interference phenomenon can be regarded as a proof of the specific effect of chaulmoogra oil in the treatment of leprosy ; it coincides with the clinical experience that a long-lasting treatment only is successful."

FRANCIS, J. & SPINKS, A. **Antibacterial Action and Metabolism of Five Sulphones.** *Brit. J. Pharmacol. & Chemotherapy.* 1950, Dec., v. 5, No. 4, 565–83, 10 figs. [32 refs.]

" 1. It is necessary to incorporate nearly a hundred times as much sulphetrone as 4 : 4'-diaminodiphenylsulphone (DDS) in the food of mice in order to produce a given therapeutic effect against streptococcal septicaemia. Smaller amounts of diasone and promin are required, and the acetaldehyde bisulphite derivative of DDS, 2196, has nearly the activity one would expect from its content of DDS.

" 2. Differences in antibacterial potency among these five sulphones are even greater in culture media when care is taken to prevent breakdown of the soluble derivatives of DDS : if the medium is autoclaved after the drugs have been added their ' activity ' is greatly increased, owing probably to liberation of DDS.

" 3. A method of estimating free DDS in the presence of the soluble derivatives is described, and it is shown that the therapeutic effect produced by any of the soluble derivatives is closely related to the blood concentrations of free DDS.

" 4. The chief breakdown of the soluble derivatives probably occurs in the stomach : 2196 is the only one studied that liberates DDS to an appreciable extent in the presence of blood or after parenteral administration. Sulphetrone was rapidly excreted, mostly unchanged, when given parenterally. Others have shown that when DDS is given parenterally it is very slowly excreted.

" 5. The results of concurrent studies carried out in man are reviewed. It is evident that doses of only 200–300 mg. a day of DDS produce as good, or better, effects in the treatment of leprosy than much larger doses of the soluble derivatives. It is concluded that DDS is to be preferred for the treatment of leprosy.

" 6. The nervous symptoms produced by DDS in some animals are described."

SCHNEIDER, J. & RAYROUX, J. Traitement de la lèpre par les sulfones. Concentration sanguine et élimination urinaire de la diamino-diphényl-sulfone et d'un de ses dérivés après injections espacées de suspensions huileuses. [**Treatment of Leprosy with Sulphones. Blood Levels and Urinary Excretion of Diamino-diphenyl-sulphone (DDS) and One of its Derivatives after Spaced Injections of Oily Suspensions.**] *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 7/8, 452–62.

In view of the immense numbers of leprosy patients requiring treatment in the endemic areas of the disease it is impracticable to give daily doses of sulphones to more than a small proportion of them. The authors have therefore investigated methods of giving suspensions of the drugs at longer intervals, controlled by estimations of the sulphones in the blood and in the urine to ensure the maintenance of adequate amounts in the system. Tables are recorded of the daily estimations in relation to the doses used and the following conclusions are arrived at. A suspension of DDS in arachis oil in sufficient dose is eliminated progressively and allows a constant blood level for at least a week. The same is true when DDS is suspended in ethyl chaulmoograte ; the latter is preferable in that an active agent against leprosy is combined with the parent

sulphone. An effective weekly dose of DDS was found to be between 0·625 and 1·0 gramme, but the authors advise a single dose of 1·25 gm. of DDS suspended in 25 per cent. of ethyl chaulmoograte every fifteenth day as being easy to administer to a very large number of patients. They already have had several months' satisfactory experience of this plan and intend to continue it for several years. *L. Rogers*

FÉRON, J. Une thérapeutique de choc dans le traitement de la lèpre. [**A Form of Shock Therapy in the Treatment of Leprosy.**] *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 7/8, 389–90, 4 figs. on 2 pls.

This paper records the results of treatment of leprosy by intraspinal injections. Photographs are included of a patient aged 16 years with symptoms of two years' duration, who had been brought up by a leprous wet-nurse. In 1932 he showed typical anaesthetic macules and, after some weeks of treatment by intravenous injections of copper and gold preparations, an intraspinal injection was given of an anti-cancerous preparation composed of yeast, colloidal metal and organic extracts. This was followed by violent headache and rigidity of the neck and trunk, which began to subside after two days. The earlier injections were then returned to and three months later a clinical cure resulted. He was re-examined in 1950, when it was found that the recovery had persisted after 18 years in the absence of further treatment.

In another case, in a peasant aged 30 years, who showed complete anaesthesia of the lower part of the trunk and of the lower limbs, an intraspinal injection of 5 cm. of "collobiase" and chaulmoogra was given in 1932. He had shock and a dramatic meningeal reaction, followed by return of sensation in 8 days. In both cases the reactions were impressive. The author therefore thinks that the injection of certain drugs, such as the parent sulphone DDS, into the spinal canal is worth testing further in the treatment of leprosy. *L. Rogers*

DOULL, J. A. **Laws and Regulations relating to Leprosy in the United States of America.** *Internat. J. Leprosy.* New Orleans. 1950, Apr.–June, v. 18, No. 2, 145–54.

GRIMES, C. **Organization of the Antileprosy Campaign in Madagascar.** *Internat. J. Leprosy.* New Orleans. 1950, Apr.–June, v. 18, No. 2, 135–44, 1 fig.

This is an instructive account of the fight against leprosy in Madagascar. A missionary leper colony was founded in 1890 and its work extended in 1900. In 1932 a prophylaxis service was created under Dr. Grimes and a decree giving the required powers was passed in 1935 ; subsequent critical conditions have limited the application of measures for detecting and isolating the sufferers. Cases reported by doctors, midwives and nurses are mostly advanced ones, but detection of cases by mobile groups under European doctors is more effective. Where the author examined the people in selected areas, 95 to 98 per cent. of the population were seen and an incidence of 1 per cent. was found, equivalent to a total of 40,000 infected in a population of 4 millions. In the years 1936–48, 15,711 cases were discovered and 12 leprosaria have been established for them. Ten segregation villages are also at work with treatment by trained male nurses ; the cost is furnished by their families or tribes. Only non-infective cases are treated at their homes. A map illustrates the distribution in the island of the various types of institution. The most serious problem is the number of children born through mixing of the sexes in the institutions ; they are removed from their parents at once and reared in crèches, with a mortality

of 2 to 3 per cent. only. The total such offspring of leprous parents is now 150 and in time any possible hereditary influence will be ascertained.

L. Rogers

MONTESTRUC, E. & BLACHÉ, R. La vaccination au B.C.G. dans la prophylaxie de la lèpre. [**BCG Vaccination in the Prophylaxis of Leprosy.**] *Rev. Colon. de Méd. et Chirurgie.* Paris. 1950, Nov. 15, v. 22, No. 184, 358–60.

The authors refer briefly to the immunological relationships between leprosy and tuberculosis and quote from the literature in support of the desirability of vaccinating with BCG infants who are exposed to contact with leprosy.

As far back as 1938, the authors, in Martinique, saw a case of an infant whose mother suffered from lepromatous leprosy which rapidly became worse as her pregnancy advanced : she was thus highly infectious at the time of parturition. As the newborn infant could not be separated from the mother, it was thought desirable to undertake BCG vaccination. This infant, and two others born of the same mother in 1940 and 1941 were vaccinated with BCG at birth and kept under constant observation. All three were re-vaccinated regularly at 1, 3, 5 and 7 years. Today, at the ages of 12, 10, 9 they are in excellent health and show a 1 /100 Mantoux reaction and a positive Mitsuda test.

Four other similar cases are reported. These children are now aged 12, 9, 7 and 5 years. All were vaccinated with BCG at birth, and two were re-vaccinated at the age of one year. The eldest, at the age of 4 years, developed a suspicious skin lesion on the forearm. Close supervision was exercised. The lesion has now disappeared and all four children are without signs of leprosy. Thus seven children of 5 to 12 years living in close contact with highly infectious cases of leprosy and vaccinated with BCG at birth and usually later have not developed the disease.

Four other infants, living in the same condition of exposure, but not vaccinated with BCG, have developed leprosy at 11 months, 3, 5 and 7 years respectively : three are lepromatous and one tuberculoid in type. The authors note, despite the small number of cases, the encouraging possibility that BCG has an anti-leprous action and should be tried for this purpose on an increasing scale in countries where leprosy is endemic. *H. J. O'D. Burke-Gaffney*

DUBOIS, A. & FESTER, Alice. A propos de la culture du bacille de Stephansky. [**Observations on the Culture of Stefansky's Bacillus.**] *Ann. Inst. Pasteur.* 1950, Nov., v. 79, No. 5, 567–70, 1 fig.

The following is a translation of the authors' summary :—

Macroscopic colonies (shown in the photograph) of acid-fast bacilli developed on pieces of rat lepromata preserved in 50 per cent. glycerin in the refrigerator. The colonies were probably those of Stefansky's bacillus. The nature of the phenomenon could not be exactly defined and subcultures could not be obtained.

The experiments continue. *H. J. O'D. Burke-Gaffney*

HANKS, J. H. & BACKERMAN, T. **The Tissue Sites most favorable for the Development of Murine Leprosy in Rats and Mice.** *Internat. J. Leprosy.* New Orleans. 1950, Apr.–June, v. 18, No. 2, 185–207, 1 fig. [25 refs.]

The authors report data on the growth and accumulation of the Hawaiian strain of the murine leprosy bacillus in rats and mice in their various tissues. Known numbers of bacilli from lepromata were inoculated into two or more sites in each animal and Indian ink was used to identify the skin sites of the

injections. The anterior chamber of the eye, the brain, peritoneal cavity and testis were also injected with the organisms, details of which are recorded. Thus a basis was provided for a quantitative concept of the growth and accumulation of murine leprosy bacilli in the two animals used. Increasingly favourable developments of the murine leprosy bacilli were noted in the following order : brain, eye, cutis, subcutis and testes, the last being the most favourable of all. Greater concentrations of bacilli were found in the organs of susceptible mice than in those of the more resistant rats. The infection in the rats used did not disseminate readily from skin or testicular lepromas ; progressive visceral or lymphatic infection could not be produced by intraperitoneal inoculation. Subcutaneous inoculation of bacilli, which had been modified by refrigeration in glycerol or had been washed in dilute NaOH, only resulted in latent lesions. The shift from the classical murine toward the human lepromatous type suggests further such animal experiments to shed light on human leprosy. *L. Rogers*

KIKUTH, W. & MUDROW-REICHENOW, Lilly. Ueber die Diamidine und ihre Wirksamkeit auf die experimentelle Leprainfektion der Ratte. [**The Activity of Diamidines in Rat Leprosy.**] *Ztschr. f. Immunitätsf. u. Exper. Therap.* 1950, Jan. 7, v. 107, Nos. 1/2, 139–51, 1 fig. [37 refs.]

The authors review the chemotherapeutic activities of the diamidines and describe the effect of stilbamidine and pentamidine in experimental rat leprosy. It appeared that the rate of development of lepromata in animals treated with stilbamidine was much slower than in control animals, but the general state of infection was not appreciably influenced. Pentamidine possessed a comparable activity. *J. D. Fulton*

HELMINTHIASIS

MEIRELLES, M. M. Helmintíases em soldados do exército da Guarnição da Capital da República. [**Helminthiasis in Garrison Troops in the Capital of the Republic.**] *Rev. Hig. e Saúde Pública.* 1949, Jan.–June, v. 7, Nos. 1/2, 23–7.

The author examined the faeces of 571 apparently healthy soldiers in the Federal District of Brazil for the presence of ova and larvae of helminthic parasites.

The results are shown in 10 tables.

In all, 460 (80·6 per cent.) were positive and 234 (40·9 per cent.) were infested by one species of parasite only. The actual percentages in the latter case were *Necator*, 18·4 per cent. of those examined, *Ascaris* 14·0, *Trichuris* 6·3 and *Strongyloides* 2·3 per cent.

Other tables show that 155 (27·1 per cent.) were infested by two species of helminths and 66 (11·6 per cent.) by three species. Five men were infested by all four species. *S. mansoni* was also encountered in 4 men, but never alone : it was always associated with other parasites.

Four tables show the infestation rates for each of the four species separately. They were encountered in association with other parasites in the following percentages : *Necator* 32·9, *Ascaris* 28·5, *Trichuris* 21·4 and *Strongyloides* 8·9. It is thus apparent that these four species were found, singly or with other parasites, in 51·3, 42·5, 27·7 and 11·2 per cent. of cases respectively.

The author notes the high incidence of helminthic parasites in these apparently healthy soldiers and stresses the need for a systematic campaign against this parasitization. *H. J. O'D. Burke-Gaffney*

DI PIETRO, P. Su alcuni casi di avvelenamento da sostanze assunte a scopo antielminitico da nativi dell' Africa Orientale. [**Cases of Poisoning by Anthelmintics used by East Africans.**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1950, Aug., v. 31, No. 8, 597–600.

The author tells of poisoning by three substances used in East Africa as anthelmintics. The first is *kousso*, made from the flowers of *Hagenia abyssinica*, collected when the flowers are fully out ; they are dried and powdered. Fifteen to twenty grammes are taken after brief maceration in 100–200 cc. of water, or a decoction concentrated by prolonged boiling ; no purgative is taken after it. Sometimes it is taken mixed with berries of the *'ncoco* shrub [botanical name not given] ; the constitution of the mixture is then quite uncertain. Mild toxic symptoms of an acute gastritis may occur, which clears up in 2–3 days, but in more severe cases there is mental dullness with small rapid pulse, dyspnoea, vomiting and diarrhoea with haemorrhages. Recovery in these cases may not be complete for 3–4 weeks. One patient died in 2½ hours after a period of intense weakness, imperceptible pulse, shallow respiration, dilatation of pupils and muscular twitching.

Another anthelmintic which may give rise to poisoning is the latex of a *Euphorbia*. The author does not know what quantity has to be taken to cause poisoning, but it seems to be a strong irritant causing ulcerative stomatitis, blood-tinged vomiting and profuse and persistent diarrhoea. These acute symptoms usually clear up in 10 days or so, but the digestive system is easily upset for some months.

Lastly, *Benzine* ; in the usual doses it may cause pyrosis and slight intoxication like that of alcohol, but two persons who took 30–50 cc. complained of intense burning pain in the epigastrium, great thirst, nausea, headache and vertigo with small quick pulse. Recovery was complete in 2–3 days.

H. Harold Scott

PARAENSE, W. L. & SANTOS, J. M. O sexo do *Schistosoma mansoni* nas infestações produzidas por cercarias de um unico molusco. [**The Sex of *Schistosoma mansoni* in the Infestations produced by Cercariae from a Single Snail.**] *Mem. Inst. Oswaldo Cruz.* 1949, Mar.–June, v. 47, Nos. 1 /2, 35–49, 1 graph & 1 fig. [English version 51–62.]

Fifty-three laboratory animals (2 rabbits, 3 guineapigs, 12 rats and 36 mice) were exposed to infection with cercariae of *S. mansoni* from 53 snails, each animal receiving cercariae from a single snail only. Inoculation was by peritoneal injection of cercariae in 10 of the mice ; otherwise, the immersion method, for 30 minutes, was used. The livers of all the animals were examined *post-mortem* and worms were collected as follows : male worms in 17 animals, females in 14, both sexes in 6 and in 9 the sex was undetermined : 7 animals were negative. From these results it is calculated that the normal sex ratio in *S. mansoni* is 1 : 1. It is considered that in 40 of these animals the infection was unisexual (*i.e.*, males or females only were present) and bisexual in 6, or 13 per cent. But on statistical grounds this figure of 13 per cent. would require an infestation index of 51 per cent. in the snails, whereas in fact there was only a 21 per cent. infestation rate in the snail population from which the 53 infested snails were obtained. This discrepancy is explained on the grounds of mortality rate in infested snails.

Successive inoculations of rats with cercariae from single snails, with one exception, gave qualitatively the same results from the first and second inoculations. Other results and conclusions arrived at from the experiments are, that *S. mansoni* females do not attain sexual maturity in the absence of

males ; in bisexual infections the number of males exceeds that of females ; rats are less susceptible than mice, rabbits or guineapigs. Pregnant rats, mice and one rabbit were inoculated, but no congenital infestation was observed.

J. J. C. Buckley

BARLOW, C. H. **Snail Ponds.** *J. Parasitology.* 1950, Oct., v. 36, No. 5, 447–50, 2 figs.

The author's work on snails in connexion with control of schistosomiasis in Egypt is well known. He draws on his experience of over 20 years there and notes the difficulties encountered in maintaining snails in sufficiently large numbers under natural conditions.

This paper describes and illustrates the construction of suitable canals and ponds for the rearing and observation of snails. Clear line drawings show in detail the layout and in cross-section the structure of the ponds. Ponds must be matured long enough before use or the snails will be killed by the lime in the water. Fish, such as *Gambusia* are put in the water to keep down mosquitoes. In a properly constructed and matured pond, frogs and toads appear at once, water insects arrive and *Physa* makes its appearance. Mud water is in such proportion that water lilies flourish and seed annually and rushes and cat-tail flags grow luxuriously. Except for the deliberate selection of species, the flora and fauna of these canals correspond with those of natural environment. Special provision is made for the length, depth, direction, etc., of canals to conform with existing environmental conditions. Dimensions of the canals and ponds are given. Adjustments may be made in cold countries or for tropical and subtropical snails.

These notes are extremely practicable and should assist considerably those interested in constructing such snail ponds and canals themselves.

H. J. O'D. Burke-Gaffney

NOLAN, M. O. **Laboratory Tests on the Rapidity of Molluscacidal Action of Copper Sulfate in High Concentration.** *Pub. Health Rep.* Wash. 1950, Nov. 10, v. 65, No. 45, 1481–5. [14 refs.]

" Tests were carried out in the laboratory to determine if copper sulfate in the high concentration of 20 parts per million would be quickly lethal to planorbid snails (*A. glabratus, Biomphalaria boissyi*, and *Bulinus contortus*).

" Under conditions considered optimum for maximal toxic action, the copper salt did not kill *A. glabratus* or *B. boissyi* within contact periods of 1 through 5 hours. Based on subsequent death of the snails in fresh water, the percentages of mortality for each hour of exposure from 1 through 5 were : *A. glabratus*, 55, 85, 90, 93, 95 ; *B. boissyi*, 58, 78, 58, 75, 65. *B. contortus* snails were more susceptible to the copper than the other two species. They survived the 1- and 2-hour contact periods, but the majority of them died within 24 hours following their removal from the chemically treated water into fresh water. Dead snails were observed in increasing numbers at the end of each additional hour of exposure from 3 through 5 hours, and the snails that survived these exposures all died within the following 24 or 48 hours."

KUNTZ, R. E. & STIREWALT, M. A. **Laboratory Evaluation of Two Dinitrophenols as Molluscacides.** *Proc. Helminthological Soc. of Washington.* 1950, July, v. 17, No. 2, 95–102. [23 refs.]

" 1. Two dinitrophenols, dinitro-*o*-cyclohexylphenol (DCHP) and its dicyclohexylamine salt (K604), have been tested under laboratory conditions to evaluate their promise as molluscacides.

"2. Both DCHP and K604 show considerable promise as snail killing agents.

"3. DCHP is the better of the two compounds since it fulfills in greater part the requisities for a practical molluscacide. DCHP is lethal to the non-operculate snails, *Australorbis glabratus* and *Bulinus contortus*, within a 24-hour contact period under the conditions of these experiments at 2 and 3 ppm., respectively ; it is only slightly toxic to mammals and to aquatic plants, and is not sufficiently harmful to most aquatic invertebrates to cause a drastic biological imbalance in natural waters ; it is very persistent ; and it is not adversely affected by water with high organic content.

"4. Both DCHP and K604 are lethal to goldfish at concentrations required to kill snails.

"5. Laboratory tests indicate that further study of these compounds under field conditions is warranted."

PESIGAN, T. P. **Studies on Schistosomiasis : Progress Report on the Philippine Campaign as of June 30, 1950.** *J. Philippine Med. Ass.* 1950, Aug., v. 26, No. 8, 339–48, 1 folding map.

Although the existence of schistosomiasis in the Philippines has been recognized since 1906 remarkably little is known about it locally and hitherto almost nothing has been done. In 1948 a Schistosomiasis Research Programme was initiated by the Philippine Department of Health. This is a preliminary report of the progress of the programme of the inquiry. After initial handicaps and delays there are now six field research units which cover as much as is possible of the known affected areas ; as a result of their work the magnitude of the public health problem of schistosomiasis is becoming better understood by the legislature.

The known endemic foci are indicated on a map ; and in a series of tables are set out figures showing the incidence of Far Eastern schistosomiasis in various places. Of 314·3 kilometres of stream and swamp searched for the local vector, *Oncomelania quadrasi*, 115·68 kilometres were found to harbour these snails ; 10,165 square metres of stream and swamp so infested were treated chemically (with dinitro-o-cyclohexylphenol or the dicyclo-hexylamine salt of dinitro-o-cyclohexylphenol). Stool examinations of 35,509 persons in the known endemic areas revealed an incidence of *Schistosoma japonicum* infection of 12·11 per cent. Fouadin treatment of 2,407 of those so shown to be infected resulted in the disappearance of the ova from the stools of 78·21 per cent. of them ; Nilodin was used in the treatment of 153 patients, but the number treated with this drug has been inadequate for assessment of its value."

The value of various liver function tests and of intradermal tests is being examined, and haematological examinations are being done.

A. R. D. Adams

DUROUX, A., TABUSSE & MARTY, J. L'échinococcose métastatique pulmonaire. (A propos d'une observation anatomo-clinique.) [**Anatomical and Clinical Observations on a Case of Metastatic Pulmonary Echinococcosis.**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1950, Nos. 29/30, 1501–8.

LARGHERO YBARZ, P. Equinococosis heterotopica del peritoneo de origen esplenico. Accidente agudo de parto de vesícula gigante y hemorragia peritoneal. [**Heterotopic Hydatid of the Peritoneum of Splenic Origin, with Acute Abdominal Manifestations and Peritoneal Haemorrhage.**] *Arch. Uruguayos de Med., Cirug. y Especialidades.* 1950, June, v. 36, No. 6, 525–9, 3 figs.

COUTELEN, F., RAZEMON, P. & BIGUET, J. La longévité des échinocoques. Étude critique à propos d'un kyste hydatique de la rate évoluant depuis plus de vingt-trois ans. [**Longevity of *Echinococcus*. Study of a Hydatid Cyst of the Spleen developing over more than 23 Years.**] *Ann. Parasit. Humaine et Comparée.* 1950, v. 25, No. 4, 267–75, 2 figs. on pl. [13 refs.]

HILLEMAND, P., GILBRIN, E. & TOULET, J. Un cas d'échinococcose alvéolaire suivi pendant vingt-cinq ans avec foyers secondaires abdominaux disséminés. [**A Case of Alveolar Echinococcosis followed for Twenty-Five Years and showing Secondary Abdominal Foci.**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1950, Nos. 27/28, 1458–63.

CHANG, K. & Co-Workers. **Studies on Hookworm Disease in Szechwan Province, West China.** *Amer. J. Hyg.* Monographic Series. No. 19. 1949, May, pp. x+152, 34 figs. & 9 pls. [54 refs.]

An enquiry into the hookworm position in the Chinese province of Szechwan was undertaken by a group organized by Cheeloo University, during the years 1940 to 1944. The Rockefeller Foundation, China Hookworm Commission, in their report of 1926 had suggested that this province was heavily infected and that mulberry cultivation was probably an important factor.

The province is thickly populated ; estimates run as high as 1,700 persons per square kilometre and the total population is over 46 million, of which 90 per cent. is rural. The climate is warm and humid, and from May to September the mean temperature lies between 25° and 30°C., the optimum for hookworm infection. Rice is the most important summer crop, after which come sweet potatoes and corn. Important winter crops are wheat, barley and rapeseed. The mulberry is also cultivated.

Human excrement is carefully conserved. The night soil is placed in roughly constructed pits and stored for periods of a few days to several months. Vegetable matter is often added and the contents are applied as manure in the form of a moist compost.

The faecal specimens examined were taken from the general population in their homes and from patients attending the dispensaries. Willis's flotation method was used together with the egg-counting method of STOLL and HAUSHEER. The egg loads were recorded as *nil*, up to 399, 400 to 2,999, 3,000 to 9,999, and 10,000 or more eggs per ml. of faeces. Haemoglobin was estimated by the Sahli-Hellige apparatus.

In a mulberry cultivating area (at Suchi in Loshan district), 683 specimens were examined. The infection rates were 65·3 per cent. in males and 72·3 per cent. in females, but in only 8 and 10 per cent. respectively were the counts above 3,000 per ml. No single clinical case of hookworm disease was seen at Suchi. Night soil is applied only once a year as a fertilizer and most of the picking is done on ladders, so that hookworm infection is in no way encouraged ; the high incidence but low loads are probably due to other activities of the population.

Hookworm studies undertaken in Langchung in northern Szechwan, where the hillsides are extensively terraced and corn and sweet potatoes are the two chief summer crops, showed that of a total of 574 farmers who attended the field clinic at Langchung, the incidence of infection was 97·0 per cent. and the average count was 3,300 eggs per ml. of faeces. The health of the people who visited the clinic was badly affected by the parasite. Many of them showed typical symptoms of severe hookworm disease. The average haemoglobin reading was astonishingly low, being only 46·1 per cent. Cases with values of less than 40 or 30 per cent. were very common ; the lowest reading encountered was 10 per cent.

Studies of the Hwang Lian Ya and Lang Nan Chiao populations showed a widespread moderate degree of hookworm infection. The incidence of infection for the 516 Hwang Lian Ya cases was 78·5 per cent. and the average egg count was 1,471. The incidence of infection for the 323 Lang Nan Chiao cases was 75·5 per cent. and the average count was 1,321 eggs per ml. of faeces. The findings for both the Hwang Lian Ya and Lang Nan Chiao population groups probably do not represent the actual situation since the severe cases had been attracted to the field clinic and so were not included in the analysis of results of these two population groups.

In order to confirm the association of sweet potato and corn cultivation, another short investigation was carried out in Yingshan and Tzeliutsing in Southern Szechwan.

Of the 163 patients who attended the Yingshan field clinic as high as 98·2 per cent. were found positive for hookworm and the average egg count was 5,090 eggs per ml. of faeces. The people were badly affected by the parasite. Many of the cases were severe and the patients showed the most classical symptoms of hookworm disease. The average haemoglobin value was only 42·6 per cent. and the lowest reading seen was 9 per cent.

The studies in Tzeliutsing also clearly demonstrated the widespread nature of hookworm infection and of hookworm disease in the region. A house-to-house survey of 333 farmers who resided near the city gave an incidence of 77·5 per cent. and an average count of 1,775 eggs per ml. of faeces. Of the 255 patients who visited the field clinic 99·2 per cent. were hookworm positive and the average egg count was 4,917 per ml. of faeces. Clinical symptoms of severe hookworm disease were also commonly observed. The average haemoglobin reading was only 40·5 per cent. and the lowest value encountered was 5 per cent.

An epidemiological study was undertaken in Dong Chai Sze, near Sintu in West Szechwan to ascertain the relation of rice cultivation to hookworm infection ; these studies showed that cultivation of rice in Szechwan produces conditions unfavourable for hookworm dissemination since of the 275 rice farmers examined only 28·4 per cent. were hookworm positive and the average count was only 304 eggs per ml. of faeces. However, examination of 192 persons in Chengtu who were exclusively engaged in vegetable cultivation gave a rather high hookworm incidence (70·8 per cent.) and a moderate degree of infection, with an average count of 1,092 eggs.

The investigation was extended to the sugar-cane-growing districts and at Paimamiao near Neikiang a 62·4 per cent. infection with a mean egg count of 910 per ml. of faeces was recorded among 868 farmers. At Chaokiatu, near Chintong, where citrus trees are the important crop, a 55·7 per cent. infection rate with an average load of 698 eggs per ml. was found. In neither area was any clinical hookworm disease found.

While hookworm was widespread in Szechwan it is only in the hilly districts that it becomes of public health importance. The highest infection rates, the heaviest hookworm loads, and the severest hookworm disease have been encountered in those areas where sweet potato and corn are inter-cropped. The heaviest soil infections have also been demonstrated here.

Both *Ancylostoma duodenale* and *Necator americanus* were found in all districts ; the former predominated in the northern districts and the latter in the south.

It is pointed out that, although disinfection of night soil, either by prolonged storage or by the addition of chemicals, is the most fundamental and important method of hookworm control, it is not feasible at present in Szechwan : nor is the substitution of inorganic fertilizer for night soil. It is not practicable to prevent hookworm transmission during potato transplantation by wearing leggings and gloves or by using repellents or larvicides.

It is, however, suggested that a slight modification of the method of transplanting sweet potato would reduce the amount of human contact with the infected soil without reducing efficiency. It is also suggested that free clinics should be provided for the treatment of farmers in order to reduce the number of eggs finding their way into the soil, as well as to improve the health of the community. Much could be accomplished by educational propaganda.

L. E. Napier

BENETAZZO, B. & GAMBINI, G. Sulla patogenesi dell'anchilostomanemia. Studio clinico-terapeutico. [**Pathogenesis of Ankylostomiasis. A Clinical and Therapeutic Study.**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1950, June, v. 31, No. 6, 422–60. [Bibliography.] English summary (8 lines).

After an extensive review of the various hypotheses which have been put forward by other workers on the subject, the authors of this paper give a detailed account of very full haematological and biochemical observations which they have made on 12 cases of ankylostomiasis over a period of 2 years. The haematological work has included the study of the bone-marrow obtained by sternal puncture. They have found a marked rise in the content of erythroblasts and they attribute this to a slowing down of the maturation time and a resultant accumulation of these elements in the bone-marrow. They have studied the haemoglobin exchange, the production and elimination of bilirubin and the calcium, cholesterin and lecithin content of the blood.

The authors consider that a toxic explanation of hookworm anaemia is no longer tenable and that the condition is due to the consequential combination of loss of blood and iron deficiency. Blood is lost directly to the parasite and also through the bleeding points which persist after the parasite has transferred itself to another part of the intestinal wall, as it does from time to time. The bone-marrow has to raise its output of erythroblasts so that the lost red cells may be replaced. This in turn raises the demand for iron in the body and depletes the body reserves of this element ; in due course, red cell production outpaces the metabolism of iron and a hypochromic anaemia develops, replacement from the bone-marrow failing to make up for the full loss due to the parasite. Eventually, the bone-marrow may show signs of functional exhaustion and in such cases anaemia may persist even after the worms have been eliminated and when the loss of blood has ended. Iron in large doses may relieve the anaemia of hookworm disease even without any anthelmintic treatment, but in such cases the anaemia recurs after treatment has been discontinued. The authors give an account of the therapeutic tests which they have applied to demonstrate these facts in their patients.

Hookworm anaemia is, therefore, due to an iron deficiency which is caused by excessive demand following loss of blood.

J. Cauchi

HORTON, S. H., Jr. **Treatment of Creeping Eruption with Hetrazan. Report of 13 Cases.** *U.S. Armed Forces Med. J.* 1950, June, v. 1, No. 6, 668–71.

Thirteen patients with creeping eruption in Florida were treated with hetrazan 2 mgm. per kgm. three times daily. Their ages were 18 months to 49 years. There were no untoward reactions. The pruritus usually became normal in 48–72 hours ; if treatment was interrupted, the pruritus returned. Apparently the larvae (of " cat-and-dog hookworm ") decreased gradually in number, and not all at once. The time required for clinical cure ranged from 8 to 30 days, average 3 weeks. One patient had eosinophilia (21 per cent.) together with radiographic appearances compatible with Loeffler's syndrome of allergic pneumonitis ; he responded well to hetrazan. Of the 13 patients

treated, nine were clinically cured, two were failures (after 17 and 20 days treatment) and two failed to return to report progress but had probably responded well. [If these results are confirmed, they will form a valuable contribution to practical therapeutics.] *F. Hawking*

EPPS, W., WEINER, M. & BUEDING, E. **Production of Steam Volatile Acids by Bacteria-Free** *Ascaris lumbricoides*. *J. Infect. Dis.* 1950, Sept.–Oct., v. 87, No. 2, 149–51. [15 refs.]

A method was sought for the study of the metabolism of *Ascaris* in the absence of bacteria, in order to find whether valeric acid, a major end-product of the fermentation in the case of this worm, is produced by the nematode itself or by the bacterial flora contaminating it. A procedure is described whereby *A. lumbricoides* var. *suis* were removed from pigs' intestines and cultured *in vitro* in the presence of antibiotics, with the result that worms free from bacteria were obtained. It was demonstrated that considerable quantities of valeric acid or its isomers or both are produced by these worms, indicating that it is due to the metabolic activities of the nematode itself and not to contaminating bacteria or to any symbiosis between the bacteria and the nematodes.

Of the antibiotics used in the above procedure, chloramphenicol (chloromycetin) was the only one having a harmful effect on *Ascaris*. It was observed that the *Ascaris* free from bacteria survived *in vitro* for longer periods than unsterilized worms ; in ox serum their viability was maintained over two weeks compared with 4 days in the case of unsterilized worms. "Thus, the use of antibiotics for the sterilization of *Ascaris* affords an opportunity for investigating the nutritional requirements as well as the metabolism of this parasite." *J. J. C. Buckley*

TISSEUIL, J. Éléphantiasis et volvulose. [**Elephantiasis and Onchocerciasis.**] *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 9/10, 556–8, 3 figs. on 2 pls.

The following is a translation of the author's summary :—

The lesions of onchocerciasis are frequent in French West Africa and are easy to identify on the lumbar regions by the more or less marked thickening of the skin, in creases stretching from above downwards and from within outwards. On the other hand, true elephantiasis is very rare and *O. volvulus* does not seem to play any part whatever in the aetiology of tropical elephantiasis. *H. J. O'D. Burke-Gaffney*

PUYUELO, R. Note préliminaire sur l'onchocercose volvulaire africaine en pays Mossi. Le 3.799 R.P. (Notezine). [**Preliminary Note on African Onchocerciasis in the Mossi Country. Compound 3,799 R.P. (Notezine, Hetrazan).**] *Bull. Méd. de l'Afrique Occidentale Française.* 1949, v. 6, No. 2, 147–51.

Ocular onchocerciasis is so common in the Upper Volta that there is a Mossi proverb " Nearness to great rivers eats the eyes". In 1939, in the Ougadougou and Tenkodogo districts, examination of 823 young recruits showed cysts to be present in 10 per cent. Other investigators in 1938 estimated the frequency of ocular troubles as 10 per cent., and of blindness due to *O. volvulus* as 2 per cent. A more detailed investigation was made in 1949 around Tenkodogo where 88,289 Africans were examined ; 10 per cent. carried filarial cysts and 2·5 per cent. were blind because of *Onchocerca* infection. The number of persons carrying microfilariae in the skin was probably much higher.

Treatment was given by surgical removal of the tumours and by administration of hetrazan. The latter is effective, but causes anaphylactic reactions. The results have been published by Puyuelo elsewhere [this *Bulletin*, 1950, v. 47, 484]. *F. Hawking*

JELLIFFE, D. B. **Calcification of a Guinea-Worm.** *J. Trop. Med. & Hyg.* 1950, Nov., v. 53, No. 11, 210–11, 2 figs. [12 refs.]

When a female guineaworm does not reach the surface of the body, it dies and undergoes different forms of degeneration and produces various lesions. In many cases the dead worm becomes calcified and the frequent absence of clinical signs in such cases is reflected in the number of occasions on which such calcifications are observed at routine radiological examination.

The author, in Nigeria, cites some of the recorded lesions and parts of the body in which they have been found, but points out that the commonest sites are the lower limbs.

He then describes the case of a Yoruba boy of 15 who complained of a painless swelling on the dorsum of the right hand. It had appeared three years ago with an acute and febrile onset, but had apparently reacted to native medication and thereafter had been unchanged in its present area for 2½ years.

On examination, the swelling was found to be 5 cm. in diameter by 2 cm. in height, fluctuating and slightly attached to the deeper tissues. On palpation, several coils could be felt running spirally inside the tumour, after the manner of a watch-spring. Antero-posterior and lateral X-rays of the right hand showed the clear-cut shadow of a uniformly and densely calcified coiled guineaworm.

At operation the tumour was found to be encapsulated and was dissected out. The cyst wall was about 0·5 cm. thick and contained mucoid fluid. The calcified guineaworm was completely cretified and very brittle.

The calcified worm is illustrated in two excellent X-ray films, from which the completeness of the calcification and the disposition of the coils is clearly seen.

The author notes the unusual site, the density and uniformity of the calcification and the close spiral arrangement of the coils. Usually calcification is more irregular and shows a speckled appearance on X-ray.

H. J. O'D. Burke-Gaffney

SIUNG, O. H. **"Benadryl" in Treatment of Oxyuriasis.** [Memoranda.] *Brit. Med. J.* 1950, Apr. 8, 822.

The author noted in an asthmatic girl of seven years treated by benadryl that a threadworm infestation cleared up. He then gave a dose of 50 mgm. of benadryl daily for nine days to ten children. The infestation persisted in all but one patient who incidentally suffered from a sharp attack of diarrhoea during the course; this gave a clue. He subsequently gave benadryl in "emplets"; these are coated tablets that dissolve in the large intestine. Of four children given 10 mgm. thrice daily for nine days, two were uncured and two relapsed; they were then given 25 mgm. thrice daily for nine days and remained free of worms for seven weeks. Nine children and one mother, aged 28, were treated by 50 mgm. twice daily and thrice daily, respectively, and all remained free of worms for seven weeks. In another series of seven cases on the same dosage one only relapsed; reinfection from a companion was suspected and the patient and companion were then treated and cured.

Two younger children, 4 and 4½ years, were given 50 mgm. a day for nine days and were cured.

In no instance when "emplets" were used were any toxic effects noted; this was presumably due to the non-absorption of the drug in the large bowel.

L. E. Napier

HARRINGTON, R. F., SPINDLER, L. A. & HILL, C. H. **Freedom from Viable Trichinae of Pork Products prepared to be eaten without Cooking under Federal Meat Inspection.** *Proc. Helminthological Soc. of Washington.* 1950, July, v. 17, No. 2, 90–91.

"In light of the data presented in this paper, it is evident that meat products containing pork muscle tissue, which are customarily eaten without cooking, were free from infective trichinae after having been processed for the destruction of these organisms in accordance with methods prescribed in the Federal meat inspection regulations. The data indicate, moreover, that there has been a decline in the extent of trichinae infections in hogs during the past decade. This conclusion is attested by the fact that in the first series of examinations, conducted from March 1934, to August 1939, 3·32 per cent. of the samples examined contained trichinae with numbers ranging as high as 2,400 per half pound sample of product. In contrast to this, in the series of examinations made from July 1948, to December 1949, only 0·82 per cent. of the samples contained trichinae, the maximum number per sample being 120.

"The extremely small number of trichinae showing signs of life recovered from samples in the two series of examinations, and the failure of the feebly viable larvae to infect rats which are highly susceptible host animals, show conclusively that processing of pork for the destruction of trichinae as prescribed in the Federal meat inspection regulations is an effective safeguard against human trichinosis."

HAEMATOLOGY

DONEGANI, Joyce A., IBRAHIM, Karima A., IKIN, Elizabeth W. & MOURANT, A. E. **The Blood Groups of the People of Egypt.** *Heredity.* 1950, Dec., v. 4, Pt. 3, 377–82, 1 fig.

SILVER, H. K. **Mediterranean Anemia in Children of Non-Mediterranean Ancestry.** *Amer. J. Dis. Children.* 1950, Nov., v. 80, No. 5, 767–78, 1 fig. [Refs. in footnotes.]

"A series of cases of Mediterranean anemia in non-Mediterraneans who showed both the major and the minor manifestations of the disease is presented. The patients included Chinese, French-Filipino and Mexican children."

NOGUEIRA, J. P., COITO, A. de M. & FERREIRA, A. E. Contribuição para o estudo das drepanocitémias nos naturais de Cabo Verde. [**Study of Sicklaemia in the People of Cape Verde.**] *Anais Inst. Med. Trop.* Lisbon. 1950, July, v. 7, 239–51, 4 figs. on 2 pls. [10 refs.]

The English summary appended to the paper is as follows :—

"The authors studied the sickle-cell anemia in the people of Cape Verde island taking as a basis 2,500 individuals in the majority mongrels. They only found latent disease forms in a percentage of 3·04. They point out the interest of such a study and quote the Portuguese authors that have worked in this subject as far as this date.

"They describe the methods they employed in this study and criticise the results they obtained, and they try to compare, so far as possible, the efficiency of these methods.

"They cite facts that they observed during their work that are related with the appearing of the sickle-cell anemia character in certain circumstances only.

"They describe two cases in which only once they found sickle-cells, but they found some relations of them suffering from this latent disease.

"They present pictures in which we can see the distribution of the disease by ages, sex, and colour and a more detailed study, from the hematological point of view, of 24 individuals with this affection."

TRINCÃO, C., PINTO, A. R., DE ALMEIDA, C. L. & GOUVEIA, E. A drepanocitémia entre a tribo Papel da Guiné Portuguesa. [**Sicklaemia in the Papel Tribe of Portuguese Guinea.**] *Anais Inst. Med. Trop.* Lisbon. 1950, July, v. 7, 125–9.

The English summary appended to the paper is as follows :—

"The writers examined 500 negroes from the Papel tribe, inhabiting the Bissau island in the Portuguese Guinea. Amongst them 15 cases (3%) of sicklemia have been found. In none of them the clinical examination has shown any signs of sickle-cell anemia ; however, the laboratory findings disclosed one case of severe anemia which the authors think rather attributable to hookworm disease, a condition that afflicts 92·3% of the island native population. Other patients are probably affected by malaria."

VENOMS AND ANTIVENENES

VILLIERS, A. Contribution à l'étude du peuplement de la Mauritanie. Ophidiens. [**Survey of Snakes in Mauritania.**] *Bull. Inst. Français d'Afrique Noire.* 1950, Oct., v. 12, No. 4, 984–98, 2 figs. [16 refs.]

FLECKENSTEIN, A. & GAYER, J. Dehydrasenhemmung durch Schlangengifte. [**Dehydrogenase Inhibition by Snake Venoms.**] *Klin. Woch.* 1950, Dec. 1, v. 28, Nos. 45/46, 789.

CHRISTENSEN, P. A. & WIDDICOMBE, Margaret. **Scorpion Stings.** [Correspondence.] *Lancet.* 1950, Dec. 9, 774.

The authors in Johannesburg refer to the work of ALY, ABUL-FADL and ROUSHDY and of MCSORLEY and PERRY (*Lancet*, 1950, June 17, 1135 : *ibid.*, 1949, May 21, 889) on the use of various substances, including emetine, against scorpion venom.

They themselves worked with venom from South African specimens of *Parabuthus* and used guineapigs and mice as experimental animals. The substances tested were emetine, atropine, adrenaline, procaine, ergotamine, calcium gluconate, dimercaprol (BAL), dihydroergotamine and anti-histamine. Combinations of the last two with atropine were also tried. No significant difference in survival times or rates were found, compared with controls. Atropine suppressed salivation and respiratory secretion, and procaine abolished severe pain in envenomated animals : otherwise no alterations were noted.

The authors refer to the use by AHUJA and BROOKS [this *Bulletin*, 1946, v. 43, 478] and CHRISTENSEN and DE WAAL [*ibid.*, 1948, v. 45, 108] of local infiltration with carbolic soap solution as a protection against cobra venom. They

themselves have found that 5 per cent. carbolic soap solution increased the chances of survival of guineapigs receiving a LD_{50} of *Parabuthus* venom in the muscle of a hind-leg.

All the substances mentioned, except soap, were also tested against the venom of the spider *Latrodectus indistinctus* in mice, without effect. It is of interest to note that calcium gluconate failed, in view of its apparent beneficial effect in spider-bite in man. *H. J. O'D. Burke-Gaffney*

DERMATOLOGY AND FUNGUS DISEASES

NAUCK, E. G. Dermatologische Eindrücke aus Mittelamerika. [**Dermatological Impressions of Central America.**] Reprinted from *Der Hautarzt.* 1950, Sept., v. 1, No. 9, 421–4.

The author had occasion to spend some years in Central America and in the winter of 1949 stayed for a time in Costa Rica and by the courtesy of the hospital authorities he was able to visit the clinics daily and he here records his experiences. He does little more than list the various cutaneous affections he observed, but they form an interesting summary. Ulcers of the legs were very common, ulcus tropicum, traumatic, varicose, leishmanial, blastomycotic and others. Dermatitis verrucosa or chromoblasto-mycosis was largely limited to the legs ; he saw some 30 cases of this, from different parts of the country. Infections by *Fonsecaea pedrosoi* in its verrucose form were seen, also mossy foot, Madura foot, sporotrichosis, lichen tropicalis and dermatitis due to ticks (red ticks, locally known as *coloradillos*) and to blood-sucking Trombidiidae. Cutaneous leishmaniasis is very widespread and, of course, the more common dermatoses due to Trichophyta, favus, onychomycoses and piedra. There are about 200 known cases of leprosy among a population of about 800,000 ; of these " 76 per cent. are of the lepromatous form, 10·8 per cent. tuberculoid, and 18·6 per cent. indeterminate " [this makes 106 per cent. ; perhaps 76 is a misprint for 70]. *H. Harold Scott*

GOLDMAN, L. & O'HARA, H. Blastomicosis norteamericana. Revisión de diez y seis casos observados en el Hospital General de Cincinati, Ohio, (Estados Unidos), en el periodo 1937–1947, con seis examenes *post-mortem.* [**Review of Sixteen Cases of North American Blastomycosis observed in the General Hospital, Cincinnati, Ohio (United States), in the Period 1937–1947, with Six** *post-mortem* **Examinations.**] *Rev. Argentina Dermatosifilologia.* 1950, June, v. 34, No. 2, 131–9, 3 figs. English summary.

This is a short, general description of North American Blastomycosis (Gilchrist's disease) based on the observation of 16 cases of the disease, including 6 post-mortem examinations, in the Cincinnati General Hospital over the ten-year period 1937–1947. The report was published for the purpose of comparing the disease with the South American form of Blastomycosis (Lutz's disease). [MACKINNON and VINELLI (this *Bulletin*, 1950, v. 47, 882) expressed the opinion that the occurrence of cases of North American Blastomycosis in South America rests on inadequate evidence.] *J. T. Duncan*

MENDEZ LEMAITRE, A. Blastomicosis Suramericana y otras micosis en Colombia. [**South American Blastomycosis and other Mycosis in Colombia.**] *Rev. Hosp. de "la Samaritana"*. Bogotà. 1950, Sept., v. 1, No. 4, 3–20, 14 figs. on 9 pls. [26 refs.]

The author, as a pathologist, has made observations on the mycoses of the Republic of Colombia since 1945. The present report deals with three diseases: South American blastomycosis, chromoblastomycosis and rhinosporidiosis. In each disease, an account of the history and clinical and pathological features is followed by detailed descriptions of individual cases identified in Colombia. There were eight cases of South American blastomycosis, including the first case recorded in Colombia, and it is interesting to notice that, probably because the disease was unexpected, the diagnosis was frequently in error. The first case was diagnosed as Hodgkin's disease and at a later time as tuberculous adenitis before its true character was discovered. Two other cases were diagnosed as tuberculous adenitis but, in fact, in one of these the fungus disease was complicated by tuberculosis. Four cases were originally diagnosed as carcinoma or epithelioma and in only one of the eight cases was an initial diagnosis of South American blastomycosis made. These errors of clinical diagnosis serve to illustrate the resemblance of South American blastomycosis to various non-mycotic diseases and they indicate the need to employ a mycological examination in unusual cases where systemic fungus disease may exist. The discovery of this disease presents the public health authority of Colombia with a difficult problem and the author advocates a campaign by the united medical profession to combat and control it. The records of the cases show that the disease is not confined to a single locality.

Five cases of chromoblastomycosis were identified and the causative fungus was *Hormodendrum pedrosoi* [*Phialophora pedrosoi*].

Two cases of rhinosporidiosis were recorded, including the first case of this disease to be identified in Colombia. *J. T. Duncan*

GUIMARÃES, F. N. & MACEDO, D. G. Contribuição ao estudo das blastomicoses na Amazônia (B. queloidiana e B. sul-americana). [**Contribution to the Study of the Blastomycoses of the Amazon Region (Keloidean Blastomycosis and South American Blastomycosis).**] *Hospital*. Rio de Janeiro. 1950, Aug., v. 38, No. 2, 223–53, 16 figs. [74 refs.] English summary.

In 1931, Jorge LOBO, in Recife, found a new form of blastomycosis caused by a species of *Blastomyces* which reproduced by single buds. To this fungus, da FONSECA and LEÃO gave the name *Glenosporella loboi*, and the disease was called Lobo's disease, benign granulomatosis and, more recently, keloid blastomycosis. It appears to be chiefly a disease of the Amazon region in the Torrid Zone and only nine cases, in all, have been reported since 1931.

Summaries are given of Lobo's original case and seven other published cases, with a more detailed account of a new case. The disease affects the skin and subcutaneous tissue and takes the form of a relatively benign fibrogranulomatous lesion, consisting of histiocytes and multinucleate giant cells with a fibrous stroma and small islets of granulocytes. The granuloma is formed in the dermis and the subcutaneous tissue and the overlying epidermis is stretched out and reduced to a thickness of only 4 or 5 incompletely keratinized cells. The interpapillary pegs are obliterated and the base of the epidermis is represented by a slightly undulating line, but in the neighbourhood of an ulcer there is acanthosis. The parasite, which is seen in the giant cells, in the histiocytes or free between the cells, is round or oval in outline, thick-walled and of uniform size [the measurements are not given]. It reproduces by a single bud and

sometimes by two buds, but it does not show the multiple budding characteristic of *Paracoccidioides brasiliensis*, although an accidental clumping of the cells may suggest this form of reproduction. The parasite is frequently seen in short chains of 4 or 5 individuals. The authors' attempts to cultivate the fungus from their case were not successful.

For comparison, the authors give a description of a case of South American blastomycosis (Lutz's disease), and both clinically and microscopically the diseases appear to be clearly differentiated from each other, but there are three fairly distinctive clinical varieties of Lutz's disease, and Lobo's disease may well be a fourth. The multiple budding form of *P. brasiliensis* in the tissues is very distinctive but it is not constant and sometimes the fungus reproduces by single buds and may be mistaken for *Blastomyces dermatitidis* in the tissues. MACKINNON and VINELLI [this *Bulletin*, 1950, v. 47, 882] considered that reports of the occurrence of the North American type of blastomycosis in South America were based on this error. ARTAGAVEYTIA-ALLENDE and MONTEMAYOR [this *Bulletin*, 1950, v. 47, 493] made a study of the culture of *Glenosporella loboi* in comparison with strains of *P. brasiliensis* and *B. dermatitidis* and concluded that the fungus was, in fact, *P. brasiliensis* and therefore Lobo's disease was merely another form of South American blastomycosis (Lutz's disease). Other reports on Lobo's disease have been made by DA FONSECA [this *Bulletin*, 1947, v. 44, 610] and DE ALMEIDA and LACAZ [this *Bulletin*, 1950, v. 47, 778].

J. T. Duncan

KRITZER, M. D., BIDDLE, Marjorie & KESSEL, J. F. **An Outbreak of Primary Pulmonary Coccidioidomycosis in Los Angeles County, California.** *Ann. Intern. Med.* 1950, Oct., v. 33, No. 4, 960–90, 2 charts & 5 figs. [50 refs.]

Although cases of coccidioidomycosis have been admitted to the Los Angeles County Hospital from the surrounding area for many years, no local focus of the infection was known in Los Angeles County. The authors have shown, however, that such an endemic focus exists at Saugus, within the county, where a forestry camp for youthful delinquents is situated. Three boys from the camp were admitted to the hospital suffering from upper respiratory disorder which was eventually found to be primary pulmonary coccidioidomycosis. This led to an investigation of the members of the camp by means of the coccidioidin skin test. In this test the coccidioidin was used at a dilution of 1 : 100 and in repeat tests on non-reactors at 1 : 10. Out of 57 " hospitalized " cases with no known history of previous exposure to infection, 16 reacted to the test and a control group of boys, not " hospitalized ", yielded a much smaller proportion of reactors. A careful study revealed four cases of active coccidioidomycosis which, with the three already diagnosed, made seven infected in the camp. All seven patients and the majority of reactors to the coccidioidin test belonged to a " road crew " engaged on work in a canyon where the soil was dry and dusty for the greater part of the year.

Diagnosis of the active disease is often very difficult and there is nothing specific in the symptomatology ; in fact the early disease is sometimes asymptomatic. All of the seven patients complained of headache which was frontal, retro-orbital or occipital. Thoracic pain, a feature of five of the cases, was sometimes substernal and sometimes generalized and pleuritic. Six of the patients suffered from cough, which was productive in three. Elevated temperature occurred at some time in all cases and although usually not exceeding 101° or 102°F. reached 105°F. in a case with massive pleural effusion. Generalized lymphadenopathy was noticed in four of the cases. Minor symptoms and physical signs were sore throat and pharyngitis, epistaxis, anorexia and malaise, nausea and vomiting and loss of weight.

Radiological examinations of the chest showed adenopathy in 3, fibrosis in 3, infiltration in 2, pleural effusion in 1 and consolidation in 1, but no cavitation. For the true interpretation of the conditions shown in the X-ray films serial pictures are necessary to record the often rapid changes.

Total blood leucocyte counts on the 7 cases ranged from 6,000 to 14,200 per cmm., the average count being 8,300. In differential leucocyte counts the proportion of eosinophils ranged from 3 per cent. to 11 per cent. and five of the patients had eosinophilia, although none had erythema nodosum. The authors consider eosinophilia to be a suggestive sign in coccidioidomycosis and it was noteworthy that the eosinophilia seemed to decrease with the subsidence of symptoms. The present paper appears to be the first to draw attention to the presence of abnormal lymphocytes in the blood ; these resembled the Downy Type I lymphocyte and, in conjunction with generalized lymphadenopathy, the diagnosis of infectious mononucleosis had to be considered in three of the cases, but in none did the heterophile agglutination test give a positive result. The red blood cell sedimentation rate is commonly accepted as an indication of the progress of a case and is used as a guide in prescribing ambulant treatment. In the present series it was increased in 4 of the cases and normal in 3 and the authors failed to find a definite correlation of the sedimentation rate and the severity of the symptoms ; in fact, in some of the cases a transient increase of the rate was recorded after all symptoms had disappeared, while in the only fatal case among the seven, the recorded sedimentation rate never exceeded 7·5 mm. per hour.

All of the patients reacted to coccidioidin, but in two only with the low dilution of 1 : 10. In the fatal case sensitivity was still demonstrable with the 1 : 100 coccidioidin shortly before death. Serology in the form of the specific complement fixation reaction offers a satisfactory basis for diagnosis. The test gave positive results in 6 of the 7 cases ; the remaining patient, although giving a negative result, was as ill as the others, had definite radiological findings and was sensitive to coccidioidin. Complement fixation was given with the cerebrospinal fluid of the fatal case with meningeal involvement.

Coccidioides immitis was found by direct examination in one specimen of sputum and one of cerebrospinal fluid (meningeal infection) and it was also isolated in culture from the cerebrospinal fluid of the fatal case. Cultivation of the fungus from gastric washings is always difficult, even when it can be found in the material by direct examination.

The general account of this investigation is preceded by an illuminating survey of the literature dealing with the clinical aspects of coccidioidomycosis, and followed by detailed descriptions of the seven cases.

Readers interested in coccidioidomycosis are recommended to consult this important paper in the original. *J. T. Duncan*

HOEKENGA, M. T. & TUCKER, H. A. Sensibilidad a la histoplasmina y a la coccidioidina en Honduras. Informe sobre 300 enfermos. [**Histoplasmin and Coccidioidin Sensitivity in Honduras.**] *Bol. Oficina Sanitaria Panamericana.* 1950, Nov., v. 29, No. 11, 1135–8.

The English summary appended to the paper is as follows :—

" Three hundred male natives of Honduras, ranging in age from seven to eighty-two years were tested intradermally with histoplasmin and coccidioidin in a dilution of 1 : 100 at La Lima Hospital, La Lima, Honduras. There were 125 (40·2 per cent.) reactors to histoplasmin ; 14 reacted to coccidioidin with induration of five or more millimeters in diameter (4·1 per cent.). Only one of the latter group reacted to coccidioidin alone.

" Histoplasmosis was found once in Honduras in 1926 and has not been seen since. *Coccidioides immitis* has not been identified in this area. Proper explanation for the findings here reported will depend on future developments, that is, either the identification of *H. capsulatum* and of *C. immitis*, or the demonstration of other causes for intradermal sensitivity to these antigens. In the light of evidence presently available, we feel the latter explanation is the more suitable working hypothesis."

TROPICAL OPHTHALMOLOGY

TSOPELLAS, V. **The Action of Lutazol and Ophtazol in the Treatment of Trachoma.** *Amer. J. Ophthalm.* 1950, May, v. 33, No. 5, 704–8.

Lutazol is the sodium salt of para-sulphamido-phenyl-azo-salicylic-acid and is supplied in the form of 2 cc. ampoules of a 2 per cent. solution, or in tablets of 0·5 gm. Ophtazol is the lithium salt of the same acid and is used as a collyrium in a 1 per cent. solution. These drugs are produced by the Roussel Laboratories and together are known as G 33. The mode of administration of this sulphonamide is divided into two successive stages, the intensive and the supplementary. During the intensive stage of treatment, the patient is given 50 tablets of Lutazol by mouth within 5 days, *viz.*, 12 tablets on each of the first two days ; 10 on the third ; 8 on the fourth ; and 8 on the fifth day. At the same time, 2 drops of Ophtazol are instilled into the eyes three to five times a day. Finally, 2 cc. of Lutazol are injected under the conjunctiva on the first and eighth days of treatment. The supplementary stage of treatment consists in giving 4 to 8 tablets of Lutazol daily for two to three weeks after the intensive stage has ended. The same dosage can be repeated after an interruption of two to three weeks.

Tsopellas treated 48 cases with G 33 and the following are his conclusions : It has proved beneficial and has been particularly effective in complicated trachoma ; pannus subsides and ulcerations are quickly healed. In cases of secondary pyogenic infection, the drug is effective. It has a beneficial effect on both subjective and objective symptoms of trachoma, but does not cause complete disappearance of the trachomatous follicles. For the eradication of these follicles, the administration of G 33 should be combined with diathermic cauterization, for the purpose of shortening the period of treatment. G 33 is tolerated to a high degree ; no dangerous complication of the drug was observed.

E. O'G. Kirwan

SINISCAL, A. A. **The Sulfonamides and Penicillin in Trachoma.** *Amer. J. Ophthalm.* 1950, May, v. 33, No. 5, 715–24.

During the past decade there has been considerable controversy as to whether the sulphonamides have a specific effect on the virus of trachoma. Most investigators claim that they do have a specific effect and base their claims upon clinical observations. These drugs stand as first choice in treatment because of their relative mildness of action as well as the apparent specificity against the trachoma virus. The various sulphonamide eye-drops have proved to be more effective than tablets used alone internally by the mouth. The combination of eye drops and tablets given internally yield the best therapeutic results.

Gantrisin (Nu-445, a new sulphonamide) solution (4·3 per cent.) and sodium sulphacetamide solution (10 per cent.) seemed to be ideal for local use in

trachoma. Sulphathiazole, sulphadiazine and sulphapyridine, Combisul (a combination of equal parts of sulphadiazine, sulphamerazine and sulphathiazole) and Gantrisin have proved to be of value when given in combination with the sulphonamide drops. Sulphadiazine, Combisul and Gantrisin were least toxic and were found the most satisfactory.

Penicillin and bacitracin have no effect in trachoma itself but are useful in clearing up secondary infections and thus serve to shorten the period of the disease.

The routine treatment that produced the best results is the combined use of 10 per cent. sodium sulphacetamide or 4·3 per cent. Gantrisin drops every two hours into the conjunctival sac ; sulphadiazine, Combisul or Gantrisin in adequate doses by the mouth for one week ; and 10 per cent. sulphacetamide ointment applied liberally to the conjunctival surfaces at bedtime. The average newly infected case of mild to moderate severity will subside within a period of ten days to three weeks. Moderately severe cases will require several weeks of treatment. Severe cases and cases of long duration with complications will necessitate prolonged treatment from one to several months. Resistant cases are given an intermediate course of treatment with silver nitrate drops (0·2 per cent.) early in the morning, followed by zinc sulphate eye drops (0·125 per cent.) every two hours for the rest of the day. During this period, all sulphonamide medication is stopped. *E. O'G. Kirwan*

HEAT STROKE AND ALLIED CONDITIONS

LEE, D. H. K. **Physiology as a Guide to combating Tropical Stress.** *New England J. of Med.* 1950, Nov. 9, v. 243, No. 19, 723–30, 1 fig. [17 refs.]

This Cutter Lecture, delivered at the Harvard School of Public Health, presents a wide review of the physiological problems of life in the tropics.

On the subject of air-conditioning the author expresses himself as conservative. For "sojourners" in the tropics full scale air-conditioning of offices and houses may be desirable ; but for permanent residence some compromise must be made with the climate, and then no more is recommended than counteracting the heat load in the kitchen and in hot industry, removing real discomfort in sleeping quarters, and providing refreshing change in public places of recreation. To cool offices and leave homes untreated is unsound.

Experience suggests that he who maintains some degree of activity in hot weather fares best, and this agrees with the social requirement that activity is desirable. This advocacy of activity must not be extended uncritically to the mere maintenance of a high metabolic rate. When necessary work involving activity is being carried out, the work should be done efficiently and with the minimum of effort. More study is needed of the length and arrangement of work periods. There seems to be no need to change the duration of sedentary or moderately active work from that common in temperature climates, but in heavy work more rest pauses may be necessary, and hours may have to be shortened. The siesta is not favoured. If work is started early the hot period comes towards the end of the day's work, and can be tolerated because of that. The sedentary worker may need mild physical activity during the hot hours.

Experienced experimental subjects usually allow some degree of dehydration to develop during acute exposures. The daily urine volume of 1,500 cc. mentioned in textbooks is not maintained in hot weather. The usual volume

is 800 to 1,000 cc. A lower output invites urinary calculus, the incidence of which is probably unusually high in the tropics. Many residents in the tropics should drink more water.

The consumption of salt tablets may be carried to an unnecessary extent. For moderate to heavy work in a hot dry climate 7 gm. extra salt a day are recommended; for acclimatized men doing such work in a very hot climate 14 gm. are desirable, and for unacclimatized men in the same conditions 21 gm.

Skin disturbances are common. Aeration of the skin, reduction of friction, and a less enthusiastic use of soap are recommended—antiseptic applications are not.

Possible physiological causes of the lassitude that is experienced in the tropics are discussed. Physical activity or incidents that capture the interest remove the inhibitory processes and should be sought in planning activity during the hottest hours. Heavy meals should be avoided, and alcohol is even more effective in disinclining one to work.

Those who go to the tropics for long periods must not only adapt themselves to local conditions, but must also regard the new location as "home", with all that that implies. All possible services must be developed so that it may be so. Full education, even up to university standard, should be provided whenever possible. It should not be necessary to split families by sending the children to the home country for education. And on retirement officials should be able to remain on the scene of their life's work. The conception of "leave" as a respite is wrong. The American term "vacation" conveys a better conception of what should be regarded as the nature of a furlough period.

In the tropics the ratio of unskilled to skilled labour is likely to be great. But the skilled should not be exempt from manual exertion. To make exemption from manual effort a badge of social superiority in any climate is contrary to sound mental hygiene.

The art of man-management is more important in the tropics than under temperate conditions, and this fact should be driven home to those responsible for directing policy and administration in tropical areas. *Thomas Bedford*

PROTOZOOLOGY: GENERAL

MACDONALD, A. **Incidence of Toxoplasma Infection in North-West England. Transmission of Antibody from Mother to Foetus.** *Lancet.* 1950, Nov. 18, 560–62.

Since the discovery of human toxoplasmosis, the range of its distribution has been rapidly increasing, until there remains no doubt that it is a cosmopolitan disease. The number of cases recorded in Britain is still small and little is known regarding the incidence and distribution of the disease in this country.

The present paper deals with the results of serological tests for toxoplasmosis carried out on infants and mothers in north-west England. While the complement-fixation test was used as a routine, the Sabin-Feldman dye test and the neutralization test were also employed for detecting antibody in all doubtful and positive cases. The cases examined comprised three groups:—(*a*) Twelve children with both chorioretinitis and cerebral calcification, which were accepted as undoubted cases of toxoplasmosis; (*b*) Eighty-eight children with more doubtful signs of toxoplasmosis; (*c*) Controls, consisting of sera from

"normal" adults and children. In the first group, positive tests for toxoplasmosis were obtained in 10 children ; in the second group only 4 had positive sera ; while of 250 "controls" 13 sera from adults were positive for toxoplasmosis, suggesting that about 5 per cent. of the "normal" persons had symptomless infections. It is pointed out that the existence of such infections should be taken into consideration when the results of laboratory tests are interpreted.

Comparative tests of the sera of mothers and infected children, carried out in 10 cases, indicated that there was no apparent relation between the titre of antibody in the two groups, and that the infant's age is not necessarily a reliable criterion of the amount of complement-fixing antibody in its serum. It was also demonstrated that in the serum of the mothers there was no marked decline in the C-F titre two years after they had given birth to infected children.

The authors have also gone into the question whether a mother who had previously given birth to an infected child was likely to transmit the infection to subsequent children. Serological tests of mothers and their newborn infants (cord blood) showed that maternal antibody can be transferred to the foetal circulation. In some of these cases the tests were repeated several months later, when it was found that the serum of the mothers gave the same results as previously, whereas in the case of the children the titre had diminished considerably, and there was no evidence of the disease in them. Hence it is concluded that toxoplasm-antibodies are transmitted from the mother to her foetus, which is thereby protected from infection, and is born normal. It is thought that congenital transmission might take place only if the mother's infection was so recent that her antibodies have not yet had time to develop.

C. A. Hoare

COWEN, D. & WOLF, A. **Experimental Congenital Toxoplasmosis. I. The Vagina as a Portal of Entry of** *Toxoplasma* **in the Mouse.** *J. Exper. Med.* 1950, Nov. 1, v. 92, No. 5, 393–402. [21 refs.] **II. Transmission of Toxoplasmosis to the Placenta and Fetus following Vaginal Infection in the Pregnant Mouse.** *Ibid.* 403–15, 5 figs. on pl. **III. Toxoplasmosis in the Offspring of Mice infected by the Vaginal Route. Incidence and Manifestations of the Disease.** *Ibid.* 417–29. [19 refs.]

Though congenital toxoplasmosis in the infant is now a well-established fact, practically nothing is known regarding the mode of transmission of the infection to the foetus. The investigations described in these three papers were undertaken with the view to determine whether infection of the mother during pregnancy results in transmission of the disease to the foetus, and, if so, to study the conditions under which it takes place. Experiments were carried out with female mice inoculated by the vaginal route, which was selected because it was thought that it might be the portal of entry in natural human infections.

The first paper is devoted to a study of experimental toxoplasmosis in the female mouse. The infective material was obtained from the brain of mice in which human strains of *Toxoplasma* were maintained by intracerebral and intraperitoneal passages. The toxoplasm-infected mouse-brain suspension was introduced into the vagina of 365 female mice after they had been mated. Toxoplasmic infection resulted in a large proportion of the animals, the incidence in pregnant animals being 82 per cent., in mated animals without evident pregnancy 46 per cent., while in virgin mice it was 27 per cent. The majority of infected mice showed no symptoms of disease, but in a minority there were neurological and respiratory disturbances. Pregnant mice frequently succumbed to the infection in the terminal stages of pregnancy or shortly after parturition.

The authors discuss the possibility that the vagina might serve as a portal of entry in human toxoplasmosis by transmission from the male during sexual intercourse, or by contamination through infected faeces or urine. It is admitted, however, that there is no evidence to support these views. It is thought that the high susceptibility of pregnant mice to toxoplasmosis might explain the high incidence of congenital human toxoplasmosis and the symptomless infection of the mothers, who are comparable to those pregnant female mice which acquired a symptomless infection after vaginal inoculation.

The second paper deals with transmission of the disease to the offspring of pregnant female mice infected by the vaginal route. After the animals had died of the infection, or were killed at various stages of pregnancy, the maternal tissues, placentas and foetuses were examined microscopically, as well as inoculated into test animals in order to demonstrate the presence of parasites before they could be detected visually.

It was shown that the infected mice transmitted toxoplasmosis to the placentas and to foetuses *in utero*. The parasites inoculated into the vagina produced primary foci in its wall, from which they entered the blood stream, whence they were carried to various tissues, including the placenta, in which they produced disseminated lesions between the 3rd and 9th day of pregnancy. From the placenta the toxoplasms were carried into the foetal circulation. They could be demonstrated in suspensions of foetal tissues beginning from the 17th day of pregnancy by subinoculation of test animals, but histological examination of foetuses failed to show any lesions. It is concluded that before birth the parasites are restricted to the foetal blood.

In discussing the bearing of their experiments on congenital toxoplasmosis in man, the authors suggest that the maternal parasitaemia during pregnancy necessarily precedes invasion by the parasites of the placenta and foetus, irrespective of the portal of entry in the mother. It is thought that in the human being this occurs early in the course of the maternal infection. It is also suggested that some cases of spontaneous abortion and foetal death in human beings are due to inapparent toxoplasmosis, as in the case of mice.

In the third paper the authors give an account of the course of toxoplasmic infection in the surviving offspring of infected mice. Congenital toxoplasmosis occurred only in those young mice whose mothers had been infected between the 7th and 9th days of pregnancy, whereas the offspring of those infected later were normal. On the other hand female mice infected before the 7th day had a placental infection but usually did not give birth to viable young. The highest incidence of congenital toxoplasmosis (57·6 per cent.) resulted from two vaginal inoculations, on the 8th and 9th days of pregnancy. The majority of the infected young mice remained symptomless, some showed evidence of retarded development, while others became ill or died between the 2nd and 4th weeks of their life. Pathological changes were absent from newly-born mice but developed after the 9th postnatal day.

The authors finally discuss the bearing of the foregoing observations on congenital toxoplasmosis in man. It would seem that any portal of entry—not necessarily the vagina—which produces maternal parasitaemia during pregnancy, might lead first to infection of the placenta and ultimately of the foetus. In pregnant women there is a long period in which transplacental transmission to the foetus may take place. When it occurs shortly before parturition, signs of toxoplasmosis in the human infant may not become evident until several weeks after birth. However, when the foetus becomes infected long before parturition, the symptoms may be present at birth. Symptomless infections observed in many mice also have their parallel in human cases.

C. A. Hoare

WYLLIE, W. G. & FISHER, H. J. W. **Congenital Toxoplasmosis. With a Note on the Pathology** by I. A. B. CATHIE. *Quart. J. Med.* (n.s.) 1950, Jan., v. 19, No. 73, 57–66, 6 figs. (2 coloured) on 2 pls. [41 refs.]

Toxoplasma, of which there is only one known species, *T. gondii*, was first found by NICOLLE and MANCEAUX in 1909 in a rodent in North Africa. The first human infection in an infant was described by WOLF, COWEN and PAIGE in 1939. Since this date many cases have been reported in America—both North and South—and in several European countries, in persons of all ages. The clinical picture in the severe case in infants is so typical that it has been possible to make many retrospective diagnoses, several of which have been confirmed from preserved pathological specimens.

In older children and adults the disease runs a less characteristic course and, quite obviously from the many instances of congenital infection of the children of apparently healthy mothers, the infection is frequently subclinical ; this fact is supported by the serological tests. The ophthalmological signs of retinopathy or retino-encephalopathy are often the only clinically diagnostic signs.

The largest group is that of infants infected congenitally ; most of these have died early, but a few have survived with visual and mental defects. The symptoms most commonly noted are muscular twitchings and convulsions, jaundice, hepato- and splenomegaly, cyanosis, irregular breathing and drowsiness ; enlargement of the skull is common, but microcephaly also occurs, the temperature may be raised, normal or irregular ; the ocular disturbances include rolling of the eyes, nystagmus, strabismus, inequality of pupils, and less frequently iridocyclitis ; and disturbances of the central nervous system are evidenced by spasticity, hemiplegia and facial palsy.

In older children the disease may run a rapidly fatal course or recovery may follow encephalitis having a duration of a week or so.

Post-mortem. An encephalomyelitis of a severe degree is always present. *Toxoplasma* is found intra- or extra-cellularly in many organs and tissues, but characteristically in the central nervous system and the retina.

The case reported by the authors was a child of 5 years, in which the evidence pointed to congenital infection. The child was born and developed normally except that her vision was thought to be defective and she had a squint. She came for treatment because she had had two fits in the previous two months ; the first was accompanied by clonic movements of the right side and the second by urinary incontinence.

She was blind in the left eye and the right eye showed extreme myopia. There was an extensive opacity of the right lens and the fundi showed extensive irregular overlapping areas of choroido-retinal atrophy. The X-ray of the skull showed diffuse irregular calcifications in the frontal and parietal lobes. Ventriculography showed extreme ventricular enlargement suggesting gross cerebral atrophy, except in the frontal lobes, and electro-encephalography gave a grossly abnormal record.

On physical examination the mother was normal.

The diagnostic methods available include isolation of *Toxoplasma* from the cerebrospinal fluid, intradermal reaction with toxoplasmin, the complement-fixation test, and the neutralizing and cytoplasm-modifying antibody tests.

The serum tests are positive in varying percentages in suspected groups ; *e.g.*, in 63 per cent. of patients with congenital retino-choroiditis, in 6 out of 7 of the mothers and in 7 out of 9 of the siblings of suspected patients.

In the case reported *Toxoplasma* was not isolated ; a doubtful result was obtained with the intradermal test ; a complement-fixing titre of 1/16 was obtained with the patient's serum and 1/32 with the mother's (1/16 is considered

positive) ; the neutralizing antibody test was positive in the mother and doubtful in the child ; and the cytoplasm-modifying test was positive at 1/64 in the child and 1/128 in the mother. In view of the " burnt-out " nature of this case, these findings are considered diagnostic. *L. E. Napier*

GARNHAM, P. C. C. **Blood Parasites of East African Vertebrates, with a Brief Description of Exo-Erythrocytic Schizogony in** *Plasmodium pitmani*. *Parasitology*. 1950, Oct., v. 40, Nos. 3/4, 328–37, 49 figs. on 2 pls. [48 refs.]

The author records observations made by him in the course of 15 years on the blood protozoa and spirochaetes of various vertebrate animals—except man—of Kenya. He describes new species of *Haemogregarina*, *Hepatozoon*, *Pyrhaemocyton* and *Spirochaeta* and a new genus, *Atoxoplasma*, created for a sporozoon of undefined systematic position, found in birds. Further information is provided regarding a number of known Haemosporidia, a trypanosome and a piroplasm. Rodhain's *Plasmodium epomophori*, from a fruit bat, is transferred to the author's genus *Hepatocystes*. In *Plasmodium pitmani* of skinks, exoerythrocytic schizogony is described for the first time. It is of the *gallinaceum*-type and takes place in the monocytes of the spleen and heart of the lizard. *C. A. Hoare*

ENTOMOLOGY AND INSECTICIDES : GENERAL

CALIFORNIA MOSQUITO CONTROL ASSOCIATION. **Proceedings and Papers of the Eighteenth Annual Conference of the California Mosquito Control Association held at Agriculture Hall, University of California, Berkeley, California, February 1, 2, 3, 1950.** [Edited by H. F. GRAY, R. F. PETERS & G. E. WASHBURN.] 90 pp., 4 figs. [Numerous refs.] Berkeley 1, California : Post Office Box 649.

Among the introductory speakers, FREEBORN made a tribute to the life and work of the last Professor HERMS. Harold Gray then discussed some modern trends in mosquito abatement in California, stressing the importance of proper irrigation methods.

WILSON described some of the annoyance due to mosquitoes and blackflies in Alaska and the difficulties of control owing to the large areas of sparsely populated, impenetrable bog.

WILKINS described the apparatus and methods of using DDT to control mosquito and gnat (*Holoconops kerteszi*) larvae, houseflies and earwigs. Further practical details of mosquito control in the field were given by DOANE, with particular reference to the terrain of holiday resorts in Cape Cod, Massachusetts.

HAYES outlined some laboratory tests with *Aëdes dorsalis* which proved that DDT had no influence on their rate of hatching.

WOODY and LINDQUIST gave accounts of current work in the field and the laboratory in Oregon. In the laboratory tests, it was shown that a number of new synthetic insecticides (DDT, DDD, methoxychlor, BHC, Heptachlor) were more toxic at 55–60°F. than at 90°F. However, the reverse was true for others (chlordane, dieldrin, aldrin, and parathion).

HU briefly surveyed the problems of mosquito control in Honolulu.

REEVES described the curious recent history of the Yakima valley in Washington. In this fertile area of about 500,000 irrigated acres, enormous quantities of synthetic insecticides have been used against agricultural pests.

The result was a very drastic reduction of houseflies and mosquitoes, though no special measures had been used against either of these insects.

MARCH and METCALF reviewed their work on DDT-resistant houseflies (reported fully elsewhere) and BOHART and MURRAY described some recent indications of increased resistance to larvicides shown by *Aëdes nigromaculis* and other salt-marsh mosquitoes.

The health hazard to man of new insecticides was outlined by SCHMELZER, and LEMMON explained some of the regulatory controls designed to safeguard their use.

After the business meetings of the Mosquito Control Association, three papers followed on the management and organization of irrigation schemes in relation to mosquito breeding and its control (by ROWE, SMITH and BUCHANAN). On the same subject, STEAD described some engineering considerations in regard to water pollution, which might affect the mosquitoes concerned. PRUESS considered the matter from the administrative angle of a trustee of one of the schemes.

Four following speakers (SMITH, REEVES, SMITH and THURMAN) took part in a symposium on ecology in relation to mosquito control, treating the subject in a very general and historical manner. Further speakers in this symposium were THURMAN on the biology of *Aëdes* mosquitoes in the San Joaquin Valley, California ; MARKOS on the anophelines in California ; and BROOKMAN on the ecology of *Culex* mosquitoes in this region.

A series of short papers concluded the conference, mainly devoted to special problems such as, tidewater areas, rice fields, areas intermittently flooded and river bottoms. *J. R. Busvine*

HENNIG, Willi. **Die Larvenformen der Dipteren. Eine Uebersicht ueber die bisher bekannten Jugendstadien der zweiflügeligen Insekten. I. Teil.**

This book is reviewed on p. 306.

HADDOW, A. J. & VAN SOMEREN, E. C. C. **A New Species of** *Stegomyia* **Theobald from the Ruwenzori Range, Uganda.** *Ann. Trop. Med. & Parasit.* 1950, Oct., v. 44, No. 3, 281–4, 1 fig.

SASA, M., KANO, R. & TAKAHASI, H. **A Revision of the Adult Japanese Mosquitoes of the Genus** *Aedes*, **Subgenus** *Aedes*, **with description of Two New Species.** *Japanese J. Exper. Med.* 1950, July 30, v. 20, No. 5, 631–40, 7 figs.

SASA, M., KANO, R. & HAYASHI, S. **A New Species of Mosquito,** *Aedes koreicoides* **n. sp., from Hokkaido.** *Japanese J. Exper. Med.* 1950, July 30, v. 20, No. 5, 627–9, 6 figs.

CHAMBERLAIN, R. W. & SIKES, R. K. **A Safe Method of handling Mosquitoes for Virus Transmission Experiments.** [Research Notes.] *J. Parasitology.* 1950, Oct., v. 36, No. 5, 499–50.

The method has been tested with *Culex quinquefasciatus* [*C. fatigans*] but may be suitable for other mosquitoes.

A pint-sized ice-cream carton has the bottom replaced by paraffined bobbinet and the top covered with a bobbinet lid. A ⅜ inch hole is cut into the side and plugged with a cork. Up to 100 female pupae are put into the carton which

is then set into a pan containing 1 inch of water. After the adults emerge a moist cotton-wool pad is kept on the lid and a raisin is put under the pad two nights a week. The mosquitoes are provided with blood meals by suspending a chick 5 to 10 days old in a muslin bag with a hole cut in it through which the plucked breast protrudes. A liner of cotton-wool may be employed to keep the chick warm and to absorb discharges. The chick in the bag is lowered on the lid of the carton and left overnight. Next morning a feed of over 90 per cent. is usually obtained.

To remove unfed females or males, the carton is placed inside a well-lighted mosquito cage having a sleeve at each side. A curved aspirator is inserted in the hole at the side of the carton and the aspirated mosquitoes are blown into another carton inside the safety cage. Cast pupal skins cause no inconvenience and egg rafts may be removed with a pipe cleaner while the carton rests in the water. Under favourable conditions the mosquitoes can be kept alive for 30 days. *H. S. Leeson*

HAFEZ, M **On the Behaviour and Sensory Physiology of the House-Fly Larva, *Musca domestica* L. I. Feeding Stage.** *Parasitology.* 1950, Oct., v. 40, Nos. 3/4, 215–36, 28 figs. [49 refs.]

The methods employed for studying the reactions of the house-fly larva essentially an arena divided into two parts offering alternative environments are discussed in detail. The experiments may be divided into those testing humidity reactions, temperature reactions, reactions to smell, and to combinations of factors.

As a result of the humidity experiments, it was found that the larvae changed course more frequently and moved at a faster rate at lower than at higher humidities. Below 50 per cent. relative humidity, the larva did not react as readily to alternative humidities, but above that it showed a preference for the wetter side. The higher the humidity, the greater the intensity of the reaction. This humidity reaction seems to depend on the relative humidity of the air rather than its saturation deficit. It was concluded that the organs functioning hygroscopically were minute, tufted structures, a pair occurring ventrally on each segment of the thorax. The larva showed little or no adaptation to the humidity to which it had previously been exposed.

It was also found that the course pursued by the larva varied with the temperature and was more convoluted when the latter was high. Though the rate of movement rose proportionately with the rise from 10 to 40°C., the larva tended to slow down after the initial period and to pursue a straighter course, thus showing a gradual adaptation. Below 25°C. the larva was not as sensitive to temperature differences as it was to those above 35°C., when the higher temperatures were avoided. From experiments carried out in dry air, moist air, and moist air with water, it was shown that the larvae seemed to prefer lower temperatures in dry air. The converse is also true. No definite temperature receptors were located. There was generally no adaptation to previous temperatures. The larva preferred the smell of pig-dung to horse-dung, and the latter to milk. It reacted positively to ammonia and acetone, but was repelled by acetic, formic, propionic and butyric acids. When exposed to a combination of factors it was found that under experimental conditions, and probably under natural environmental conditions, the larva reacts more strongly to the stimuli of temperature and humidity than to those of light and smell. Adaptations to other than natural occurrences of the latter two are quite possible and not generally dangerous for the larva.

The mechanisms of orientation with respect to temperature, humidity and smell are discussed. *G. W. A. Talbot*

RIEMSCHNEIDER, R. & ROHRMANN, B. Über die Zucht DFDT-resistenter *Drosophila melanogaster* M. [**Breeding of DDT-Resistant** *Drosophila melanogaster.*] Reprinted from *Anzeiger für Schädlingskunde.* 1950, v. 23, No. 10, 148–9, 1 fig.

A stock of *Drosophila melanogaster* was split into two lines ; one was selected through 32 generations by exposure to DFDT (fluoride analogue of DDT) films in Petri dishes. The increase in resistance in this line compared with the untreated line is given in the following table :—

Generation	Percentage mortality after exposure for 2½ hours		Percentage mortality after exposure for 2 hours	
	Normal	DFDT-resistant	Normal	DFDT-resistant
1	100	—	75	—
11	100	80	80	55
16	100	70	70	50
20	100	62	70	35
32	100	50	70	30

The most satisfactory method of exposure of the flies to insecticide was a modified form of the Petri dish film test method. Flies enter Petri dishes which have been treated with 5·0 cc. of 15 gamma p,p-DFDT in acetone solution, directly from the culture jars through an aperture in the lid of the Petri dish, thus eliminating the use of an anaesthetic. *C. M. Harrison*

ZUMPT, F. **Key to the Stomoxydinae of the Ethiopian Region, with description of a New Haematobia and a New Rhinomusca Species from Zululand.** *Anais Inst. Med. Trop.* Lisbon. 1950, July, v. 7, 397–426, 7 figs.

ZUMPT, F. & GRAF, H. **Medical Importance of Mites.** *South African J. Clin. Sci.* Cape Town (incorporating *Clin. Proc.*). 1950, Sept., v. 1, No. 3, 196–212. [97 refs.]

The relations of mites to human diseases are very confused. In addition to those mites which are known to be important vectors of disease, there are a large number of mites which have been reported occasionally to attack man, or to cause dermatitis ; and blood-sucking mites can often ingest and maintain pathogenic organisms without, necessarily, being able to reinfect man. This review attempts to catalogue some of the medically more important mites and mite-borne diseases. The term " mite ", in this case, is applied to all Acarina, excluding the ticks.

Dermatitis is caused by the bites of " Laelaptidae " (Laelaptidae, Parasitidae, Liponyssidae and Dermanyssidae), Pediculoididae and Trombidiidae. Tyroglyphids and Tetranychids cause dermatitis but not by their bites. Demodicidae and Sarcoptidae (scabies mites) live in the skin and so may, on occasions, the Cheyletid mite, *Harpyrhynchus tabescentium.*

Tarsonemids and Tyroglyphids are periodically reported in association with malignant growths in man. Mites of these two families, and Pediculoididae too, have sometimes been implicated in asthma, bronchitis and gastro-enteritic conditions. No mention is made of *Pneumonyssus*, which occasionally causes pulmonary infections in man and monkeys.

Passing to diseases of which mites are or may be vectors the authors give a list which includes various diseases of the typhus group, notably scrub typhus, rickettsialpox, Q fever and the encephalitides ; African relapsing fever ; plague

and leprosy [the evidence in some of these cases is slight]. This list is also presented in the form of a table. *J. H. Sudd*

DIAS, J. A. T. S. A propósito de alguns lotes de carraças provenientes da colónia de Angola. [**Some Collections of Ticks from Angola.**] *Anais Inst. Med. Trop.* Lisbon. 1950, July, v. 7, 155–97, 24 figs. & 2 pls. [29 refs.] English summary.

TRAVIS, B. V. **Known Factors causing Variations in Results of Insect Repellent Tests.** *Mosquito News.* 1950, Sept., v. 10, No. 3, 126–32.

Tests with insect repellents frequently show wide ranges in repellent times. The experiments described analyse the factors causing variations in tests with dimethyl phthalate, indalone, 6–12, and a mixture of 6–2–2 (6 parts dimethyl phthalate and 2 parts each of 6–12 and indalone) against *Aëdes aegypti*, *Aëdes taeniorhynchus*, *Aëdes sollicitans*, *Anopheles quadrimaculatus* and *Stomoxys calcitrans*.

Repellents proved to be more durable on some people than on others. Although dimethyl phthalate used against *Aëdes aegypti* had an average repellent time of 247 minutes in 3,406 laboratory tests, three subjects always received bites immediately after treatment. Repellents remained effective for longer periods on persons with dry skins than on those with moist skins. No significant differences were obtained between the repellent times for treated arms or legs. Six subjects treated with indalone and exposed to *Aëdes sollicitans* had average repellent times of $143 \pm 18{\cdot}8$ minutes for arms, and $146 \pm 19{\cdot}0$ minutes for legs.

The chemical may vary in effectiveness from batch to batch. A sample of dimethyl phthalate used against *Aëdes aegypti* had an average repellent time of 21 minutes, yet a second sample of this chemical had an average repellent time of 132 minutes.

Variations also occur in the repellent times with different broods of mosquitoes. Dimethyl phthalate used against *A. taeniorhynchus* in June 1943 had an average repellent time of 214 minutes, one month later the average was 50 minutes, and in September of the same year 213 minutes. The differences could not be accounted for by meteorological conditions.

When biting rates are low, the repellent time is extended, whereas a high population of insects results in the repellent material being less effective.

The different repellents too, show various degrees of effectiveness against different species of insect. In general there is less variation with a 6–2–2 mixture than with other standard repellents. *C. M. Harrison*

YATES, W. W. **The Toxicity of several Insecticide Residues to Mosquitoes common in the Pacific Northwest.** *Mosquito News.* 1950, Sept., v. 10, No. 3, 132–4.

Three genera of mosquitoes common in the N.W. Pacific, *viz.* : *Aëdes*, *Culex* and *Culiseta*, were tested by contact with residues of chemicals applied from acetone solution at the rate of 10 mgm. sq. foot, pyrethrum alone being used at 0·1 mgm. sq. foot and also at 0·05 mgm. with 0·5 mgm. piperonyl butoxide. One set of tests showed the time required to knock down all mosquitos exposed continuously to the residue and a second set the mortality after 24 hours on exposure to a residue for two minutes. Female mosquitoes only were used, being less susceptible than males. Results showed that *Aëdes* were killed more quickly than *Culex* with DDT, methoxychlor, parathion and pyrethrum. Pyrethrum, parathion, lindane and the fluoro analogue of DDT caused the most rapid knockdown of all species, and dieldrin, aldrin and heptachlor were

slow to cause knockdown but gave almost complete mortality in 24 hours. The ethoxy analogue of DDT was inferior to DDT and its fluoro analogue, TDE and methoxychlor. It was impossible to compare the results closely since several chemicals gave 100 per cent. kill. *R. Nash*

DEONG, E. R., PEER, K. C. & FANCHER, L. W. **A New Generator for producing Dry Aerosols with Organic Insecticides.** *J. Econom. Entom.* 1950, Aug., v. 43, No. 4, 542–6, 5 figs.

Earlier types of thermally produced aerosols depend on a slow combustion mixture to volatilize the particles of insecticide. [See BUSVINE and KENNEDY, *Bulletin of Hygiene*, 1949, v. 24, 678.] These insecticide smoke generators destroy a proportion of the insecticide owing to the high temperatures reached. The authors describe (without giving full details) a new type of mixture, which evolves large volumes of steam and other gases and seldom exceeds a temperature of 250°C. An aerosol is produced which consists of particles of insecticide and water, about 6 μ in diameter. The water evaporates in about 30 minutes and the particles begin to agglomerate, forming aggregates about 10–50 μ in diameter. The insecticide is deposited in crystalline form, largely on horizontal surfaces (about 75 to 80 per cent.). When DDT is used, long crystals tend to form, up to 200 μ in length and projecting up from the surface. [Probably rather too large to contaminate small insects like flies and mosquitoes.]

Some experiments with various insects are recorded, showing that the smokes produced with various mixtures of insecticides possess fairly good immediate action but little residual effect. Some tests with rabbits suggest that these smokes have low toxicity to mammals.

In general, the new apparatus is only a slight improvement on earlier generators, the advantages and disadvantages of which have been already noted. *J. R. Busvine*

CUTKOMP, L. K., HESS, A. D. & KEENER, G. G. **Factors influencing Spray and Thermal Aerosol Application by Airplane.** *J. Econom. Entom.* 1950, Aug., v. 43, No. 4, 456–62, 4 figs. [10 refs.]

Comparative field tests were made between aerosols produced by a venturi in an aeroplane exhaust and the spray cloud issuing from five nozzles distributed about the machine. [Similar work has been reported earlier in this *Bulletin* : see STIERLI and SCHMITZ, 1950, v. 47, 569]. The aeroplane used in these tests was a Vultee BT–13, which flies at about 120 m.p.h. and has a good downdraft. In other respects the materials and methods were very similar to those in earlier investigations.

The insecticide solution was expelled from the tanks by an electrical pump, arranged so that, with both spray and aerosol, the output per acre was about 1·4 U.S. gallons per minute, giving 0·11 lb. DDT per acre. The recoveries of insecticide from spray and aerosol, at ground level for different flying heights, compared as follows :—

Application height	DDT recovered lb. per acre			
	Centre 100 ft.		Entire 200 ft. of swathe	
	Spray	Aerosol	Spray	Aerosol
25–30 ft. ...	0·055	0·004	0·031	0·003
50 ft.	0·038	0·0015	0·022	0·001

The general distribution of the spray droplets in number and size, differed greatly from those of the aerosol. With the spray, there was a heavy peak of recovery in the centre of the swathe, especially at the lower height of application. This was due to the presence of some very large drops, which put the mass-mean-diameter up to 200 or 250 μ in this region. The mass-mean-diameter of the aerosol was of the order of 30 μ over the entire region. Recovery of aerosol at 50 feet was very low.

One or two experiments with insecticide solutions of different density suggested that greater recovery might be expected with denser particles, particularly with aerosol. Tests at different temperatures showed a much better recovery under cooler conditions. Thus, twice the amount of DDT would be deposited from aerosol or spray when the temperature was 16°C. (at 6 ft.) as compared with 22°C. It is believed that this is due to the effects of temperature on viscosity and surface tension leading to the production of larger particles.

In biological tests with larvae of *Anopheles quadrimaculatus* (both natural populations and laboratory cultures in dishes), spraying was done at low rates of chlordane, to give partial kills. Tests in watery areas, with dense low vegetation, showed that the spray deposits gave a wider and more uniform kill than the aerosol. Although the spray cloud contains more large drops, it also contains as many small droplets (<30 microns) as the aerosol, when they both reach ground level.

From the practical view point, the aerosol is unsatisfactory at flying heights above 30 ft. The spray cloud gives a more certain insecticidal effect at both 25–30 and 50 ft. A possible drawback is that the heavy peak dosage, in the centre of the swathe, may cause death of fish and other aquatic organisms, apart from the mosquito larvae. *J. R. Busvine*

METCALF, R. L. & MARCH, R. B. **Properties of Acetylcholine Esterases from the Bee, the Fly and the Mouse and their relation to Insecticide Action.** *J. Econom. Entom.* 1950, Oct., v. 43, No. 5, 670–76, 4 figs. [17 refs.]

REPORTS, SURVEYS AND MISCELLANEOUS PAPERS

RHODESIA, SOUTHERN. **Report on the Public Health for the Year 1949** [MORRIS, R. M., Secretary for Health, Medical Director and Chief Health Officer]. 55 pp., 1950. Salisbury: Rhodesian Printing and Publishing Co., Ltd.

Dr. Morris's report demonstrates in full measure again this year, the excellent work the Health Department of Southern Rhodesia continues to perform, work all the more praiseworthy when we see that shortage of staff has not yet been made up. The report is very concise, we might say condensed, rendering an abstract difficult and the dealing with only certain aspects and items becomes a necessity.

An introductory section indicates some of the more radical changes and improvements in the Health Department. A European Hospital has been opened at Chipinga, the inhabitants having been up to now 120 miles from hospital care. In Bulawayo and Gwelo wards closed on account of inadequate nursing staff have been re-opened. More provisions has been made for maternity cases and for training of African Maternity Assistants. Three more African clinics have been completed. A morbid anatomist has been appointed (this is referred to later in this review). Nursing continues to present difficulties; recruits come in fair numbers, a good proportion complete their

training, after which, as Dr. Morris, perhaps a little unchivalrously, puts it, "wastage, especially by marriage, remains at a very high level", but some continue to give temporary help. The laboratories are loaded with work, a good deal owing to investigations being asked for which would appear to be not strictly essential. Thus, close on 14,000 blood counts were done at the Salisbury laboratory and nearly 12,000 at Bulawayo, yet, says Dr. Morris, "nearly 90 per cent. . . . show no departure from normal". Teams for control of malaria and schistosomiasis continue their beneficent work and useful research has been carried out on the therapeutics of schistosomiasis by Miracil D. It proved much more serviceable for *S. haematobium* infection than for *S. mansoni*; moreover, attempts to mask the unpleasant taste of the drug by making it up as an enteric and sugar-coated tablet greatly reduced its therapeutic efficiency. The prevalence of venereal disease in the country led to a venereologist being sent from London to investigate and advise upon it; much is said to have been done and a report has been published [*Bulletin of Hygiene*, 1950, v. 25, 1129].

We pass on to speak of some of the details :—

Vital Statistics.—At the end of June 1949 the total population was given as 2,022,400, a 40 per cent. increase on that of five years earlier. The figures in brackets are those of 1944. Europeans numbered 116,000 (82,680); Africans 1,898,000, a provisional figure (1,556,000); Coloured persons 5,000 (4,100) and Asiatics 3,400 (2,870). European births numbered 3,171 or 27·3 per mille, and deaths 808 (7 per mille), infant deaths 93, giving an I.M.R. of 29, and two maternal deaths. Premature birth and diseases of early infancy accounted for 465 or more than half (57·4 per cent.) of the infant deaths, and 474 (58·5 per cent.) occurred within a month of birth. Cardiac [cardiovascular] disease heads the list of deaths of Europeans during the past quinquennium, accounting for 704 (18·9 per cent. of all deaths). During 1949 there were 76 dying with coronary disease and angina pectoris, 62 of myocardial affections and 54 from intracranial lesions of vascular origin. Cancer comes next with 514 (13·8 per cent.). During the year 129 Europeans died of cancer, mostly (53) of the digestive organs and peritoneum, next in order of frequency, respiratory system (14), urinary organs (13) and breast (10).

Of infective diseases the most important was *smallpox*. Of this there were 861 cases, but only 4 of them were in Europeans; there were 60 deaths, all among non-Europeans, a 6·9 per cent. fatality. *Chickenpox* comes next, 846 (235 Europeans) without fatality; *whooping cough* 653 cases (17 in Europeans) no deaths. Of *typhoid fever* there were 235 cases, 43 Europeans with one death and 192 non-Europeans with 33 deaths, a 17 per cent. fatality—a low rate for the former, rather high for the latter, but in most tropical countries non-Europeans are often not seen till late in the illness. *Scarlet fever* claimed a large number, 151 Europeans, but only 3 non-Europeans; one of the latter died. There were 16 cases of *poliomyelitis*, 11 Europeans, 5 non-Europeans; one of each ended fatally. *Malaria* decreased in incidence, owing, it is said, to a fairly general drought; there were 4 deaths among 999 Europeans admitted to hospital; in the table of deaths 16 altogether are attributed to malaria. *Schistosoma haematobium* infections have responded well to Miracil D in a dosage of 0·5 gm. night and morning for three days for a patient weighing 110 lb. As stated above *S. mansoni* infection does not respond, at all events so satisfactorily, to the drug. Copper sulphate is the molluscicide for standard use, but the farmers and landowners unfortunately take but little interest in the question. A film has been prepared on the subject and this may stimulate greater response. In spite of the proximity of Barotseland and Bechuanaland, no cases of *yellow fever* have been recorded in Southern Rhodesia and serological tests give no indication of any local epidemic. No

case of *plague* in man has been recorded, but a warning note is sounded by the fact that the wild rodents, *Mastomys coucha* and *Aethomys chrysophilus*, are tending to become domesticated. *Xenopsylla cheopis* and *X. brasiliensis* are among the fleas found and another, new to science, has been reported but is not described or named. *Leprosy* has responded well to sulphetrone and this news has spread so that Africans immigrate into Southern Rhodesia from neighbouring countries seeking the treatment. *Trypanosomiasis* seems to be a negligible factor ; only three cases were reported during the year, all in Africans, and two of these were certainly infected outside the Colony.

There are 12 District Nurses doing excellent work, but some local communities ask for a nurse to be allocated to them and when the request is acceded to they take little advantage of her services. Eighty-two Native Clinics have been established at which, during the year, 107,486 in-patients and 315,164 out-patients have received treatment. An orthopaedic centre is a welcome addition to the working of the Department. Forty-five Missions are given Government grants for medical work ; at these, 32,924 patients were admitted for treatment and 236,022 were attended to as out-patients. In the Mines 58,857 were employed—the numbers have fallen year by year since 1945—and there were 509 deaths (8·6 per mille), of which 77 were due to accidents and 432 to disease. The larger mines have their own medical services and these are said to be very efficient. Smaller mines employ medical officers on a part-time basis.

Of the Government Native Clinics it is stated, " a number of clinics have shown a drop in the number of patients treated ", but in a table it is shown that whereas in 1944 the number was 64,192, in 1949 it was 107,486. At some clinics " man midwives enjoy great local esteem ".

Brief notes of a few lines each are given from the reports of District Medical Officers ; it is observed that in Que Que 36 per cent. of 2,000 persons examined were infested with helminths, notably *Schistosoma haematobium* and hookworm.

At the *laboratories* an immense amount of work is done ; during the year 206,574 investigations were undertaken, an increase of 69 per cent. on the figure for 1944. Most were done at the Public Health Laboratory Salisbury (94,978) and at Bulawayo (78,722) ; as stated above more than 20,000 were blood counts which any qualified medical man ought to be able to carry out and so relieve the congestion at the laboratories.

School medical inspection revealed a good deal of unsatisfactory nutrition, especially among non-Europeans and more free meals are to be provided for the under-nourished at schools. There is a shortage of Dental Surgeons ; a mobile dental trailer is to be obtained which will benefit greatly those attending the rural schools. The health of the B.S.A. Police is recorded as satisfactory but among a total European force of 774 there were 7,649 days lost, or nearly ten days for each man, and among 1,819 Africans 12,221 days were lost ; it is noteworthy that there was no case of venereal disease among the Europeans and only 39 among the African members. Health Inspectors have far too large an area for them to carry out their duties to their own satisfaction and " one health inspector district may be contiguous with six medical officer districts " ; the difficulty is to find enough satisfactorily qualified inspectors. There are only 21 for the whole Colony.

The medical staff has been increased by the appointment of a whole-time pathologist, but apparently his pathological duties are limited to the morbid anatomy and histology branch.

As regards *leprosy*, at the two institutions, Ngomahuru and Mtemwa, there were 1,444 patients on the register at the beginning of 1949 ; during the year there were 315 admissions and 101 re-admissions, 211 were discharged, 52

absconded and 54 died. Altogether 1,860 have received treatment ; there were 42 births during the year.

The rest of the report is given up to statistical returns showing in tables the numbers admitted to hospitals and the numbers of out-patient attendances, the work of the medical missions, the maternity homes, the school inspections and the laboratories. One wonders why fractional test meals, bilharzia skin tests, examination for cancer cells in sputum and exudates, and glucose tolerance curves should be included under Medico-Legal Examinations. Research has included a thorough study of the use of Nilodin (Miracil D) in urinary schistosomiasis and the molluscan transmitters of infection and into the prevalence and control of estate malaria. During the year 28 contributions to medical literature have been published by members of the medical staff and others working in Southern Rhodesia and we must conclude by congratulating the medical service personnel on the enormous amount of work it has accomplished under no little difficulty, and Dr. Morris for his excellent report.

H. Harold Scott

BEARUP, A. J. & LAWRENCE, J. J. **A Parasitological Survey of Five New Guinea Villages.** *Med. J. Australia.* 1950, June 3, v. 1, No. 22, 724–32. [15 refs.]

A parasitological survey was included as part of a nutrition survey of five New Guinea villages. The diet of the villagers was almost entirely of vegetable origin and the staple substances were taro, sweet potato, yam, sago and bananas. The caloric intake was well below that thought desirable for Caucasian peoples.

Hookworm : Faecal specimens were collected in wax-paper containers by the villagers : from 119 to 156 samples were examined from the five villages. One gramme of faeces was emulsified in 5 ml. of water and 45 ml. of saturated salt solution were added. Only 1/150 gramme of faeces was examined and to obviate missing light infections a modified Willis flotation method was employed when no ova were found by the quantitative method. The infestations varied from 94·4 per cent. to 98·3 per cent. of the populations. The majority of the counts were under 3,000 eggs per gramme of faeces ; 5·9 per cent., 12·0 per cent., 14·0 per cent., 31·7 per cent. and 23·6 per cent. of the infections in the five villages were above 5,000 eggs per gramme. The largest numbers of eggs were found in the age group 6–21 years. There was no correlation between hookworm load and haemoglobin percentage. Nearly all the infections were due to *Necator*, only 4 out of 81 specimens being *Ancylostoma.*

The other worm infections were very unevenly distributed among the villages. *Trichuris* showed incidences of over 100 in three villages, but only 13 and 7 in the other two ; in these two villages there were 1 and nil *Ascaris* infections, respectively, compared with 13, 24 and 84 in the other three, but on the contrary, one of these villages provided 14 out of the total for the whole group of 18 *Enterobius* infections. As anal swabs were not taken, it is not surprising that there were so few of the latter infections observed. Two *Strongyloides* infections only were observed. Microfilariae of *Wuchereria bancrofti* were found in 30 of 139 films examined. *E. histolytica* was found in 47 (14·5 per cent.) cases and *Giardia* in 7 (2·1 per cent.).

The malaria-parasite rates varied from 12·5 per cent. to 48 per cent. and the spleen rates (all ages) from 11 per cent. to 50 per cent. All three species of *Plasmodium* were represented in all the villages ; *P. vivax* and *P. falciparum* were about equal in numbers and just predominated each in two villages, whereas *P. malariae*, usually found in fewer numbers, just predominated in one village.

L. E. Napier

BOOK REVIEWS

JOYEUX, Ch. [Professeur honoraire à la Faculté de Médecine de Marseille] & SICÉ, A. [Médecin général, Inspecteur du Corps de Santé Colonial (C.R.)]. **Précis de Médecine des Pays Chauds.** [Précis of Medicine in Warm Climates.] 4th Edition, entirely revised. pp. viii+1072, 332 figs. & 2 pls. (1 coloured). 1950. Paris. Masson et Cie, 120 Boulevard Saint-Germain. [3300 fr. Bound ; 2800 fr. Unbound.]

This is really a new edition (the fourth) of the former textbook on colonial medicine. It has been widened in scope and many of the chapters have been entirely rewritten and brought up to date. The general plan of the book and its all round excellence have not changed. The authors have adhered to their former method of describing the diseases of hot climates as far as possible in terms of physiological and anatomical systems and organs. Thus the book is divided into three main sections : Diseases of bodily systems and organs, such as the digestive system, the liver (under which they include amoebic hepatitis, divorced from intestinal amoebiasis), the respiratory organs, and so on ; febrile tropical diseases, divided into eruptive diseases, jaundice (including yellow fever and blackwater), and tropical fevers (including malaria, relapsing fever, dengue, plague and so on) ; and a third section on general tropical diseases, including rabies, poisonous bites and stings, etc. In some ways this arrangement is awkward and is undeniably strange to English eyes, but the authors defend their classification by emphasizing that, though it may be sometimes inconvenient, it is in line with the way general medicine is presented to the French student and young doctor, for whom this book is primarily designed. No systematic classification of disease is perfect. As they point out many different tropical conditions of widely different origins may be closely similar in the clinical picture presented, in so far as the various organs and physiological systems may be concerned. Adoption of an arrangement based on aetiology inevitably means that such similar clinical pictures, for example skin lesions or eye changes, would be scattered through the book and not brought together with the necessary emphasis.

What is the right answer ? To consider each disease separately marshalled under its aetiological group ? To arrange diseases in terms of their methods of spread ? To adopt the plan of this book ? Or alphabetical order, with convenient cross-checked group arrangements under such headings as " skin lesions " and so forth ? There is no easy answer to such queries, but it seems to the reviewer that the method adopted in this book is in some ways likely to be more useful to the busy practitioner than is our own standard method, and that, if the convenience of the doctor is to be the first consideration in the preparation of books ultimately designed for his benefit, there is a lot to be said for the alphabetical idea.

In reviewing a book of this size it is not possible to do more than get a very general impression by reading particularly closely those sections with the subject of which the reviewer is most familiar. Judged on this basis, the work is solid, clear and reasonably up to date. The clinical descriptions are very good and the details of treatment adequate. Nevertheless, it is hard to believe that a book of this great size is really what the practitioner in the tropics (or even the " *jeunes médecins et . . . étudiants,*" to whom the book is dedicated by the authors) requires to help and guide him. The reviewer believes that a book on exotic disease should be either a practical handbook or a treatise, and this one is definitely a treatise and as such finds its natural place in a reference library.

One feature of which many will approve is the ingenious method the authors employ for their bibliographic references in the text. A list of "bibliographic abbreviations" is given in the introductory pages. An example will suffice to illustrate this: "A.B.—*Annales de la Société belge de Médecine tropicale* (Bruxelles)." In the text references are written thus: "Radna (A.B., 1946)." The reader is expected [and surely this is not too much to expect !] to identify the "A.B." in the bibliographic abbreviations, and trace the article in the volume for the year indicated. To the reviewer, whose own text has so often suffered criticism for long-winded bibliographical references, this seems a simple and useful idea and one to be commended. *B. G. Maegraith*

CABLE, Raymond M. [Professor of Parasitology, Purdue University, Lafayette, Indiana]. **An Illustrated Laboratory Manual of Parasitology.** Revised Edition. pp. viii+152, 121 figs. 1950. Minneapolis: Burgess Publishing Co., 426 South Sixth Street. [$2.25.]

The first edition of this manual appeared ten years ago, at a time when courses in parasitology were offered in only a few colleges and universities in the United States, and when the medical schools, with a few exceptions, treated this subject as one of minor importance. Then came the war and with it the rapid realization that a knowledge of parasitology, particularly in its relation to tropical medicine, was an essential part of the training of a medical officer, and that the teaching of this subject must be undertaken on a wider and more extensive scale in the medical colleges throughout the United States. This war-time demand was successfully met, not only by augmenting the staff of trained teachers in the medical schools, but also by the revision of old text-books on parasitology and by the writing of new ones, while the supply of live and preserved material for teaching purposes was vastly increased, largely by the help of commercial firms.

"As a result," so writes Dr. Cable, "the premedical student has been removed from the conscience of the college teacher of parasitology, especially since the present trend is toward general education and medical educators advise their future students to obtain broad, cultural training in college and avoid courses that would be repeated in medical school. So strongly is this being emphasized at present that the college teacher may indeed feel a bit uncomfortable should a premedical student, either misguided or downright interested in the subject and haunted by the possibility of failing to gain admission to medical school, elect the course in parasitology. Nevertheless, the impetus given to the subject by war-time experience has been felt down to the college level. As a result, parasitology is now taught in scores of small colleges as well as practically all universities in the United States."

It would appear from this statement that Professor Cable's book is intended for the use of American undergraduates interested in general biology, and not necessarily embarking on a medical or veterinary career. This avoidance of medical or veterinary emphasis probably explains why, although many arthropod-borne parasites of man and his domestic stock are adequately described in one section and their vectors in another, no deliberate effort is made by the author to connect these isolated descriptions or to build up a conception of the disease they combine to produce. It also explains why, when it suits his purpose, the author does not hesitate to describe the anatomy, or stages in the life-cycle, of parasites which, although admirably adapted to illustrate the points to be emphasized, do not occur in man or his domestic stock, and which, in consequence, are not usually referred to in text-books on these subjects.

As a text-book intended for the use of pre-medical students the volume under review seems admirably adapted for its purpose. The author seldom

attempts to cover too much ground and his accounts of the various parasites are well written, presented in an interesting manner, and, with a few exceptions, the illustrations are accurate and well produced. The reviewer, however, would make the following suggestions regarding corrections or additions for inclusion in future editions : In the section on nematodes—(*a*) the drawing of the oesophagus in the filariform stage of the larva of *N. americanus* is misleading and should be corrected ; (*b*) the statement regarding the presence of a stylet " which is difficult to see in stained material " in the microfilaria of *W. bancrofti* is disputed by many authorities and might well be omitted, while the inclusion of a drawing of this larva would save much verbal description. In the section dealing with arthropods some account of mites belonging to the genus *Trombicula* should be included. The section devoted to technique is excellent and full of sound advice—how well we know those early collections " replete with slides of overstained amebae, faded blood smears, opaque nematodes, crippled arthropods, and deep, deep red flukes ". Amidst so much that is good it is disappointing to find so poor an account of the staining of thick blood films, and that no reference is made to the value of polyvinyl alcohol as a mountant for certain small arthropods. In the list of selected books Professor Cable has included " VAN BENEDEN, P.J. 1876. *Animal Parasites and Messmates.* Appleton ", cheek by jowl with the standard moderns. The reviewer applauds the inclusion and would like to see LANKESTER's translation (1857) of KÜCHENMEISTER's " *Animal and Vegetable Parasites of the Human Body* " added for good company. *R. M. Gordon*

JARAMILLO-ARANGO, Jaime. **The Conquest of Malaria.** pp. xiv+125, 36 pls. & frontispiece. 1950. London : William Heinemann—Medical Books Ltd. [21*s*.]

This interesting little volume has three sections : I. The Mosquito Malaria Theory. II. A Critical Review of the Basic Facts in the History of Cinchona. III. Progress achieved in the Prevention and Treatment of Malaria.

Part I covers familiar ground but the story is well told. The history of malaria from early days, and ancient speculations as to the nature of the disease, are briefly described. Then follows an admirable description of the discoveries which revealed the nature of the infection and the mode of its transmission. The contributions of the numerous workers in this field are justly assessed, LAVERAN, MECKEL, MANSON, BEAUPERTHUY, FINLAY, ROSS, BIGNAMI, GRASSI and others.

Part II is the most important part of the book. Very special qualifications, painstaking research among original documents and intimate knowledge of historical happenings in the 17th century in the South American countries concerned, have combined to produce a record as authentic as any we are ever likely to possess. Doubt is thrown on the credibility of several legends which have hitherto been accepted as facts, and alternative probabilities are put forward with persuasive skill. The matters dealt with include : Did the aboriginal Indians know of the virtues of Cinchona ? ; How Europeans learned of the properties of Cinchona ; The legend of the Countess of Cinchon ; The error of Linnaeus in writing the Countess's name ; Why the spelling of Linnaeus must be retained ; When was Cinchona first introduced into Europe and by whom ? Confusion regarding the tree to which the name " Quinaquina " was first applied ; Etymological origin of the words " Quina " and " Quinaquina " ; Who first wrote about Cinchona in Europe and in England ? Early confusion about the medicinal value of Cinchona. Answers are provided to many of these questions and light is thrown on all the subjects discussed.

Copies of original texts, in an appendix, add to the interest of this fascinating study.

Part III tells the story of the discovery of the Cinchona alkaloids, of recent acquisitions of knowledge regarding the exoerythrocytic cycles of development of the malaria parasites, and of the discovery of synthetic remedies which rival or supersede quinine in the treatment of malaria. The last subject is dealt with somewhat scantily ; paludrine [proguanil] monopolizes the limelight.

A surprisingly large amount of information is compressed within these 120 pages. The book is profusely illustrated and very well written.

Norman White

VISWANATHAN, D. K. **Malaria and its Control in Bombay State.** pp. 2+2+263, 22 charts, maps & photographs. 1950. Poona : Connaught House. [15s.]

This book is a record of the achievements of the Bombay State Malaria Organization since its inception in 1942, during which time it has made important contributions to the epidemiology of malaria in Bombay State and has a number of very successful malaria control schemes to its credit.

In the early years attention was confined to the highly malarious Kanara District in the south of the State. Studies made there showed the importance of *Anopheles fluviatilis* as a vector. Reports detailing these findings and others dealing with the use of malaria infection rates in infants as a measure of endemicity, the value of paludrine [proguanil] in the control of rural malaria, malaria control measures in rural areas before the utilization of DDT residual spraying, and other matters, were published in the *Indian Journal of Malariology*. The reproduction of such reports constitutes a large and important part of this volume. [These reports were summarized, as they appeared, in this *Bulletin* : 1942, v. 39, 251 ; 1944, v. 41, 641 ; 1945, v. 42, 625 ; 1946, v. 43, 285 ; 1947, v. 44, 391, 798, 38 ; 1948, v. 45, 754 ; 1949, v. 46, 16.]

Residual spraying with DDT was begun in 1945 in Kanara and adjacent districts and later extended to other parts of the State, with remarkable success. As elsewhere it is a measure that elicits the whole-hearted approval of the populations concerned and their willing co-operation. It appears also to have been of value as a preventive measure against plague. The total population so protected amounted in 1950 to 9,000,000. Extensions planned provide similar protection for another three millions. The total population of the State approximates 30,000,000. The whole State will have been completely surveyed in 1952 but even now sufficient is known of the epidemiology of malaria in different parts of the State to justify the extension of DDT spraying to all rural areas in which malaria is endemic. During 1949 it was estimated that half a million cases of malaria had been prevented in the State of Bombay at a total cost of about 18 lakhs of rupees. The annual budget of the State Malaria Organization now approximates 27 lakhs of rupees (£200,000).

A chapter of the book describes urban malaria control in Greater Poona, mainly by antilarval measures. Other chapters give the results of malaria surveys of the districts of Nasik, Panch Mahals, West Khandesh, East Khandesh, Poona and Sholapur. Nineteen species of *Anopheles* were identified during these surveys of which only three were incriminated as vectors, *A. fluviatilis*, *A. culicifacies* and *A. stephensi*.

The book is of more than local interest though its avowed object is to disseminate information as to what has been accomplished and the much more that might be done if the necessary funds be forthcoming to support an enterprise that promises rich dividends.

Norman White

HENNIG, Willi. **Die Larvenformen der Dipteren. Eine Uebersicht ueber die bisher bekannten Jugendstadien der zweiflügeligen Insekten.** [The Larval Forms of Diptera. A Survey of Present Knowledge of the Immature Stages of Dipterous Insects.] 1. Teil. 1948. 185 pp., 63 figs. & 3 pls. 2. Teil. 1950. pp. vii+458, 10 pls. & 236 figs. Berlin: Akademie-Verlag. [Teil 1. 39*s*. 6*d*.; Teil 2. 88*s*. 6*d*.]

Animals are classified, not merely as an aid to the identification of specimens, but as a generalization that one animal is to be expected to resemble another in many respects. It is, for example, possible to construct a key to British flowering plants based on their colour, height and time of flowering. Such a key would serve for their identification, but generalizations from one plant to another with its aid would probably not be valid. Dr. Hennig expounds the "Theory of Systematics" with regard to Diptera. It is not sufficient to arrange insects in groups according to their anatomical similarities, without regard to their other characteristics. Living things, according to Dr. Hennig, constitute a "*vieldimensionale Mannigfaltigkeit*", and a system which is consistent with one dimension and not with the others is entirely useless.

When one is dealing with Diptera the question of metamorphosis must also be considered. The classification must place together not only those insects whose adults are similar, but also, if possible, those whose larvae and pupae are similar. Where all these requirements are satisfied, it is almost certain that the classification represents a true picture of the evolution of the group in question. In many cases there is an incongruity between the resemblances of adults and those of their larvae; these are sometimes interesting to the systematist, as they may show affinities between well-defined groups of adults. It is also possible to imagine a group in which the resemblances of the larvae among themselves are quite unrelated to those of the adults; the author, however, has no knowledge of any such group.

To the field worker, much of this may sound like an excuse for complicated keys to genera. This, however, is not the case. After an account of the general anatomy of Dipterous larvae, the Diptera are broken down by keys as far as genera. The present two volumes cover the Nematocera. Species are arranged by genera and geographical distribution, and the synonymy, bibliography and iconography of each are listed. For example, *Aëdes aegypti* L. has eighteen references to descriptions of its various immature stages, and the reader is also told which of these descriptions contain important illustrations. In this respect it is a little unfortunate that only the author's name, the date of publication and a page reference are given. A full bibliography will be published at the end of the third volume, which has not appeared yet. Meanwhile the author recommends the reader to the *Zoological Record*. Probably an index will also be found in the third volume, as the present two volumes contain none.

Finally, it must be said that, in many cases, this work will prove to be the best guide to the literature of Dipterous larvae, as well as a valuable anatomical account in itself. However, it is not a handbook for the identification of species, and would not, perhaps, be of much use to a worker without access to a large library.

J. H. Sudd

Printed under the authority of HIS MAJESTY'S STATIONERY OFFICE
by The South Essex Recorders, Ltd., Ilford.

(27) Wt. P9/371 6/51 S.E.R. Ltd. Gp. 432